THE

Street Railway Journal.

INDEX TO VOLUME XXVIII.

July to December, 1906.

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AUTHORS' INDEX

Street Railway Journal

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Of this issue of the Street Railway Journal, 8500 copies are printed. Total circulation for 1906 to date, 221,100 copies, an average of 8190 copies per week.

New York State Association Broadens Its Scope

The Saratoga convention of the Street Railway Association of the State of New York marks a new epoch in the history of this progressive and important organization. The association has been in existence for twenty-four years, and it is not too much to say of it that its cumulative record from the date of organization to the present time, in point of usefulness and good work accomplished, places it in the front rank amond kindred associations. Those who from time to time have had the responsibility of directing its affairs have, fortunately, always been keenly alive to the best interests of the members, and have acquitted their trust on a broad-gaged plan. As is necessary when progress is to be made, the policies of the association have been modified to suit new conditions, and this year another change in policy seemed desirable. Within the last two or three years particular emphasis has been laid upon the research and educational features of the association, and a year ago the experiment was started of holding quarterly one-day conferences for the purpose of discussing and reaching conclusions on the many departmental problems and questions that are constantly coming to the front. These conferences have taken the form of informal heart-to-heart experience meetings, and have proved of the utmost value, particularly to the heads of departments and subordinate officials, whose needs for information and help are sometimes neglected where the work of an association is all carried out at annual conventions.

During the last year the New York organization has also accomplished a great deal of important work through special committees. There can be no question that this policy of turning over important topics to competent working committees is an admirable method of making progress. Often when a topic is brought to the attention of a convention in the form of a paper, the lack of time or other conditions prevent satisfactory discussion, and it is difficult to arrive at well-judged conclusions. By putting the topic in the hands of a committee, much preliminary and useless discussion is avoided, the ideas of several minds are concentrated, and the report of the committee is more likely to embody the consensus of opinion on the subject. This report then offers an admirable basis for discussion in open convention, and the chances are some definite conclusion will be reached.

The institution of quarterly meetings has brought the work of the association to the attention of roads in adjoining States and Canada, with the result that outside companies have petitioned for the privilege of participating in, and co-operating with, the New York organization. Realizing the mutual good to be derived from this broader co-operation, the members of the association at the Saratoga meeting amended the constitution and by-laws to provide for an associate membership class, which is intended to include electric railway companies in States and Canadian provinces adjacent to New York, engineering firms, financial institutions, independent engineers, and power generating and transmitting companies.

This occasion was also taken to form an allied membership class to include the manufacturers. The organization has never clearly defined a policy under which the supply men could assume a recognized place in the annual conventions. By the creation of the allied membership class the repre-

sentatives of manufacturing and supply houses will become affiliated with the organization on a definite basis.

In thus enlarging its scope and sphere of endeavor the New York Association enters upon a new era of usefulness and one that should give a record fully in keeping with its past history.

The Relations Between Employer and Employee

We commend to our readers this week a perusal of the paper on the relations between employer and employee presented by Mr. Vreeland at the last meeting of the American Academy of Political and Social Science, in Philadelphia, and reprinted in this issue. In reviewing the industrial and engineering achievements of the last twenty-five years, one is apt to overlook the changes which have been effected in industrial organization, and particularly in the life and environment of the workmen. These changes are just as real as the material improvements which have taken place in the same period, and are a logical result of the enormous aggregations of capital in industrial pursuits and general diffusion of education, with which they have been contempoiary. In consequence, we have, on the one hand, what Mr. Vreeland calls the annihilation of the individual in the personnel of great industries. On the other hand, owing to the wider education of the workmen and the more general diffusion of literature, especially of newspapers, we have a tremendous increase in his aspirations, a better knowledge on his part of events outside his own field of activity, and a broadening, though not necessarily an elevation, of his thoughts and ideas. In monarchical countries the preservation of obligatory military service for all citizens has had the effect of delaying the necessity for the same kind of reforms as are required in this country, although militarism has introduced problems, both economic and social, of which we are, fortunately, almost free. But in the United States there is a powerful movement in the direction of considering modern industrial conditions from a broader standpoint than was formerly customary, and of introducing such methods to avoid industrial disagreements as the experience of those most conversant with the conditions can suggest.

We cannot attempt at this time to review all of the points in the paper presented by Mr. Vreeland, but we ought not to fail to refer to one element creating a lack of sympathy between capitalists or executive directors and their men to which he calls particular attention. This is to the lack of judgment, coupled with domineering conduct, on the part of subordinate officials who, clothed with a little brief authority, often nullify the broader plans and purposes of their executive chiefs. It may truly be said that one of the most essential qualifications of the manager of a large industry at present is the ability to select and control the conduct of those whom he selects as his assistants, and the greatest successes in modern industrial organization have been made by those who have had this ability in a most marked degree. We admit that narrowness and lack of perspective on the part of the employee are quite as often, if not more frequently, a cause of industrial disagreements; but the aim of all, of course, should be to reduce all excuses or causes of complaint. In this connection we should bear in mind that open dissatisfaction is rarely spontaneous. Instead, it is usually the result of an accretion of a number of small troubles, such as petty rules which have done no real good, minor causes for complaint which are insignificant in themselves, and regulations which are intended for the betterment of the service, but whose object is not thoroughly understood. On the other hand, and combined with these, are unwillingness to undergo slight inconveniences for the benefit of the general good, trade unionism, the feeling of discontent fostered by many present agitators, and the desire, now too prevalent, to see those who have more money than one's self suffer financial loss. It is the effort of the modern social reformer to point out these remediable differences and to direct attention to ways in which every participant in industrial enterprises will be impressed with the fact that the prosperity of each is interrelated with that of all.

Testing Switchboard Instruments

The testing of switchboard instruments is a matter which ought not to be overlooked in a railway plant, even though the necessity for it is less urgent than in central station work. Opinions vary considerably as to the frequency with which calibrations must be made, but there is no doubt that it is unwise to let more than a year pass without checking up the instruments most directly concerned in measurements of station output. Recording wattmeters are the most important instruments in the plant, from the standpoint of operating economy, and some companies test these three or four times a year. In the 1906 Question Box of the National Electric Light Association, the Toledo Railways & Light Company advises testing recording wattmeters of the direct-current type at least once in three months, with inspection and drop of potential test across the armature once a month; induction recording wattmeters once in three months, and indicating ammeters, indicating wattmeters and other instruments used for approximate readings, once in six months.

Ammeters on feeder panels are relatively unimportant instruments, and even generator ammeters are seldom used in economic measurements. Once a year would seem to be often enough in many cases to test them, but voltmeters and totalizing ammeters ought to be kept a good deal closer to the line, for the reasons that machine potentials ought to be in close accord for paralleling, and load curves of the entire station output should be prepared upon as accurate readings as possible if they are to be of any real value. In the case of a road which buys current by instrument readings from some other organization, it is wise to check up the equipment five or six times a year. Instruments need not be removed from the switchboard for testing, as a rule, unless gross inaccuracies are found. It is seldom difficult to test ammeters, voltmeters and indicating wattmeters under service conditions, and, thanks to the flexibility with which electrical connections can be made, recording wattmeters can be compared in many plants with a standard, without disturbing the switchboard arrangements. It is a good plan to keep a few standard instruments on hand for such testing work, and these can often be employed to advantage in track and feeder determination as well as in power plant tests.

In testing large capacity recording wattmeters on direct current railway switchboards, one or two storage cells can be used to advantage for supplying current to the series coils. A steady load should be used to secure the best results. In the absence of a battery, a water rheostat can usually be

pressed into service. The potential coil usually has to be supplied from the bus-bars, with regular readings of voltage. In case an extra meter is available, a very satisfactory method is to standardize this instrument on a steady current, after which it can be inserted in circuit with the regular meter to be calibrated, and its registration compared directly with the regular railway load. A wattmeter operating on a heavily fluctuating load will record the true output within commercial limits of accuracy, for the reason that, disregarding friction, which is small, the loss from failure to respond instantly to an increase of load will be made up by a similar gain when the load is falling. There is, of course, greater incentive toward the maintenance of instrument accuracy in central station work than in railway service, for the latter does not depend upon the sale of energy for its profits. At the same time the operating efficiency of a power plant cannot be determined accurately unless the instruments are periodically checked with some reliable standard.

Rapid Transit for London

We publish this week an abstract of Vol. IV. of the Report of the Royal Commission which, in 1903, examined our American rapid transit conditions for the benefit of London. Their investigation was of very wide scope, dealing with the financial, legal and engineering phases of the question, and the Report considers all these as well as the more remote effect of rapid transit on urban populations. To begin with, it seems to have been thoroughly fixed in the minds of the commission that to carry out successfully a rapid transit scheme on broad and comprehensive lines some civic body should be endowed with substantially plenary authority in the matter. There can be no effective division of powers in dealing with matters of so large public interest, and the successful working of the New York and Massachusetts Commissions seem to have made a profound impression upon our friends from abroad. The English legal mechanism for such operations is cumbersome, and has too much lost motion to operate with the necessary promptness and precision. Another thing cordially endorsed was the co-operation between municipalities and private corporations, as shown in subway construction. It is a question whether this plan will prove so mutually satisfactory in the future, to both the public and private interests concerned, as the Commission seems to assume, but the result is certainly to get things done on a scale that would be otherwise difficult. At least, municipal direction ensures rapid transit upon a coherent plan that could be followed only with great difficulty were it entrusted to competing companies.

We are somewhat surprised to find the American single-fare system so cordially endorsed; it is, in fact, evidence of the very broad-minded way in which the Commission works. We have no doubt that once the British public gets used to it, it will prove as popular there as here. It is a system that is peculiarly well fitted to promote suburban expansion, even more difficult in London than in most large cities. A successful rapid transit system must be laid out on broad and simple lines, and unity of fares is essential to simplicity. The single fare is employed on the surface and rapid transit systems in Paris and Berlin, as well as on certain of the tube-lines in London, so it would not seem to be a very radical step to introduce it regularly in London. The value of regulating and directing surface traffic in co-operation with surface lines was also something which forced itself on the attention of the Commission, and should be highly developed in any plans for rapid transit in London. By adroit routing of cars and division of street traffic the capacity of the surface provisions for rapid transit can be very greatly increased.

We note, with more interest than enthusiasm, the strong sentiment of the committee in favor of the extensive use of subways. If they could spend about a couple of days riding in the New York subways some time next August, we are more than inclined to think that their approbation would ooze away to a very appreciable extent. We draw a distinction between the subway as a means of rapid transit and as a medium of human conveyance. In the former function it is quite unexceptionable, in the latter it leaves pretty nearly everything to be desired. There is a difference, of course, between a linear city like New York and a radial city like London, but London is enough larger than New York to make up for this difference. Seriously, the questions of public comfort involved in subway traffic are very grave indeed. The experience of the last two years has evolved problems in subway operation which were hardly suspected at the time of the Commission's visit in 1903.

We have no love for elevated roads as such, but from the standpoint of the passenger they are infinitely preferable to subways. The work of this kind that has been done abroad, notably in Berlin, is a lesson that should be studied. If elevated roads or viaducts were built in the same spirit as the subways, making the question of cost subsidiary to that of completeness, some very remarkable results could be obtained. The elevated road, as we have it in this country to-day, is distinctly a makeshift. It is too light and too resonant—in short, too cheap. The noise and vibration are more serious elements of damage to abutting property than is the necessary loss of light. A solider and more permanent structure, perhaps even of reinforced concrete arches, with side walls, improved road bed and rolling stock designed with the object of reducing noise, would rob the elevated road of the greater part of its terrors, and in most situations would be far cheaper than a subway. Certainly in some of the smaller cities now clamoring for subways such a structure would meet the requirements admirably, and would permit the easy access of suburban and interurban lines, now a matter difficult to arrange. We have not as yet reached the full benefit of multiple unit control on account of the discontinuity of service between the tramways proper and the outlying lines. One of the great problems of rapid transit is the treatment of the diverging lines of traffic as the suburbs expand. To-day there is no unity of treatment possible. Could converging cars group into trains and come fairly into the heart of a city over suitable viaducts, the problem would be solved. We, therefore, while not denying the value of subways for certain purposes, cannot regard them as a general solution of urban rapid transit, at least in their present shape, and we would recommend to our London friends a supplementary visit to the Continent before committing themselves to any comprehensive scheme of construction. We have made great advances in this country, but we cannot lay claim to a monopoly of all that is best, certainly so far as tasteful and noiseless elevated railway construction is concerned.

THE NEW CAR HOUSE AND REMODELED SHOPS OF THE INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

Within the past year the management of the International Railway Company, of Buffalo, N. Y., has begun to carry out a number of extensive improvements in its car-house and shop facilities at the Cold Springs depot. The buildings comprising this station are located within a few feet of the important Main Street line, and are also only a few minutes travel from most of the other city lines. It is therefore a most central place for car storage and repair work, as it obviates the large amount of useless mileage incident to locating car houses and repair shops at some outlying point. The car house has already been completed, and the company is now changing the old car house into a carpenter shop, mill and truck shop. In addition important changes have been made with regard to the paint shop, wheel shop, and stock rooms, etc.

THE MAIN STREET, OR FRONT, END OF THE NEW CAR HOUSE

The general lay-out of all the buildings at Cold Springs is shown in the accompanying plan, on which are also shown the tracks used for storage of cars in the open. In carrying out the new work the endeavor has been made so to arrange the different departments that a car in going through the shops will follow its natural course and not be in the way of later ones. However, most of the buildings were in existence before the changes mentioned were started, and it was found advisable to utilize them under the new arrangement in preference to tearing them down and erecting new structures. Aside from securing a practically fireproof construction, the company has recognized the importance of having plenty of daylight; in fact, the splendid natural illumination of these buildings is one of their commanding features, and can not help but lead toward securing better and quicker repair work than is possible under artificial lighting.

GENERAL TRACK ARRANGEMENT

Cars bound to the car house can come from either up or down Main Street or from the crosstown lines without reversing their trolleys, and then proceed the length of the property to Masten Street and thence to the new car house, as shown. This track arrangement, therefore, does away with the necessity of turning trolleys at any point.

CAR HOUSE

The new car house is located near the intersection of Balcom and Main Streets, forming the first of the group of buildings at Cold Springs. It is 520 ft. 4½ ins. long on one side and about 600 ft. long on the other. The structure is divided into two bays, each of which is 51 ft. 6 ins. wide between the inside columns and accommodates five tracks in the front half of the car house and four in the rear half of the structure, which contains the pits. The heights from the floor to the lower chords of the roof trusses vary from 18 ft. to 19 ft., owing to the grade of the floor. The foundations for the walls are of concrete and project 4 ins. above grade, the walls themselves being of brick. The roof is supported on brick piers 21 ins. x 24 ins., and the space between piers consists of an 8-in. curtain wall. This wall is carried up 2 ft. above the roof and capped with a tiled coping for fire protection. The roof and the walls of this structure to within 4 ft. of the floor are painted white, the rest of the walls being finished in black.

The footings, foundation walls, pit walls, pit piers, floors in the pit section and the stock and oil rooms are made of concrete. The mixture used for the foundation and floors in the rear half of the car house and that portion of the building walls

VIEW FROM SAND DRIER, LOOKING TOWARD MASTEN STREET, OR REAR END OF CAR HOUSE

for heights of 4 ins. to 14 ins. from the grade line (due to the slope) was composed of one portion of Portland cement, two and one-half parts of sand and five parts of limestone or granite crushed to pass through a 2-in. ring. For the pit walls, pit piers and footings for the same, as well as for the roof of the oil and stock rooms in this building, the mixture

chosen contains one part of Portland cement, two parts of sand and three parts of limestone or granite crushed to pass through a $1\frac{1}{2}$-in. ring.

The concrete floors were first laid to a thickness of 5 ins. and were then finished with a 1-in. layer of Portland cement mortar, composed of one part of Portland cement to two parts of sharp sand troweled to a hard, smooth finish. Catch basins and gutters formed of concrete with malleable-iron perforated covers are used for carrying off the drainage. Part of the drains are of vitrified salt glazed tile pipe bedded in the trenches. All drains which cross the car pits or connect with conductors in the two sections of the building fronting Masten Street are of extra heavy cast-iron pipe, provided with a metal swing check valve to prevent all water from backing up into the pits.

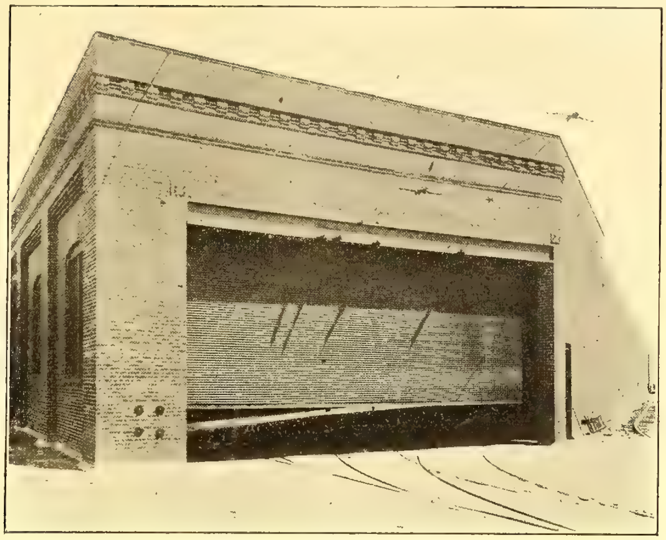
The floors of the two west sections of the car house and also the alley between the east and west sections are of cinder concrete 6 ins. thick, made of one part of Portland cement, three parts of sand and ten parts of soft coal cinders. As this part of the house is used only for the storage of cars ready for operation, it was considered that a floor of this type was good enough. It can be kept clean easily without causing much dust to arise, besides preventing dirt from getting into the cars

To fireproof thoroughly the stock and oil rooms, which are placed midway of the pits at the rear of the building, it was decided to use concrete roofing for this section. The roofs of these rooms are made of old 6-in. rails placed 4 ft. centers, covered with expanded metal and concrete 4 ins. thick, with the concrete and expanded metal haunched down and around the bottom of the rails. The skylights for each room are 6 ft x 10 ft., and are built on a concrete curb 12 ins. high and 4 ins. thick.

The gable ends of the building at the rear or Masten Street end, and at both sides of the alley in the center, were first covered with heavy gage expanded metal securely fastened to the steel trusses with metal clips. The gables were then plastered with cement mortar at least $\frac{3}{4}$ in. thick, and mixed in the proportion of one part cement to two parts of sand. Plastering was put on both outside and inside as well as at all panels and joints, at the brick work, roofing plank, and above the steel rolling doors.

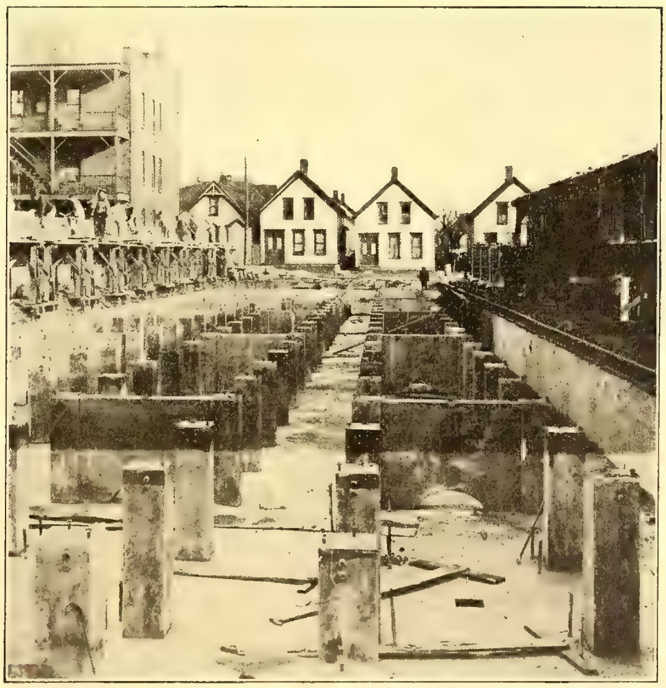
All of the lumber for the roof purlins and roofing plank consists of long-leaf yellow pine. The purlins are 6 ins. x 10 ins. and 4 ins. x 10 ins., and are bolted to angles. The skylights curbs, except for the stock and paint rooms, are $2\frac{1}{2}$ ins. x 10 ins., fastened to the iron work and roof planks, which are 2 ins. thick. The ends of the lanterns are 2-in. matched yellow pine. The trolley troughs are of No. 1 white pine, painted with one coat of boiled linseed oil to preserve the wood. These troughs have 2-in. x 6-in. braces secured to the bottom of the roof trusses, with 5-16 in. bolts between the angles of the trusses to prevent the trolleys from striking the ironwork of the roof. In addition to these, wooden insulators are attached to the ironwork to prevent carrying current through possible contact with the trolleys.

As noted above, the greater portion of the skylight curbs is made up of $2\frac{1}{2}$-in. planking, the frames for the glass forming the roof. The sash in the sides of the skylights is made

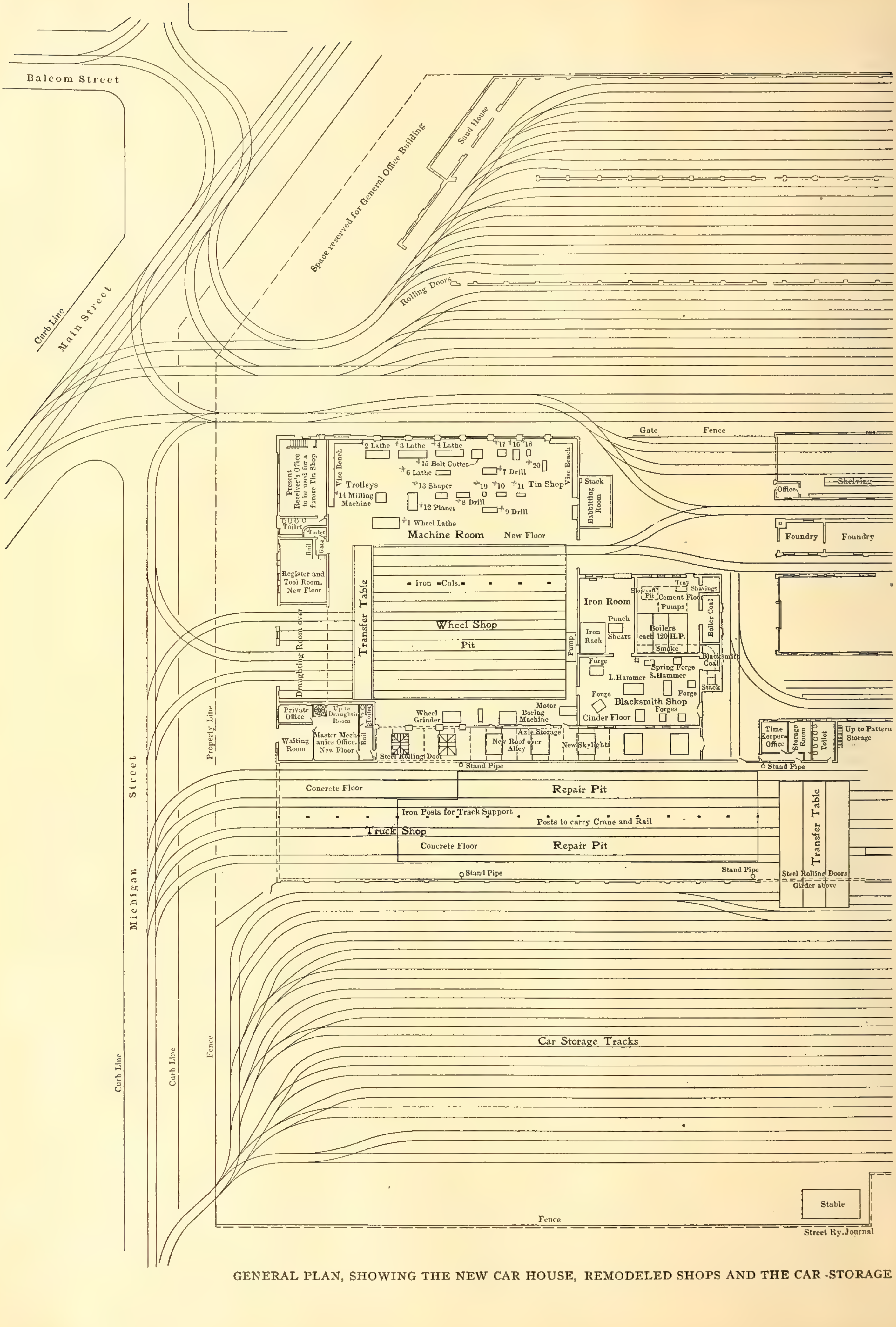


A 30-FT. STEEL ROLLING DOOR IN FRONT OF THE CAR HOUSE

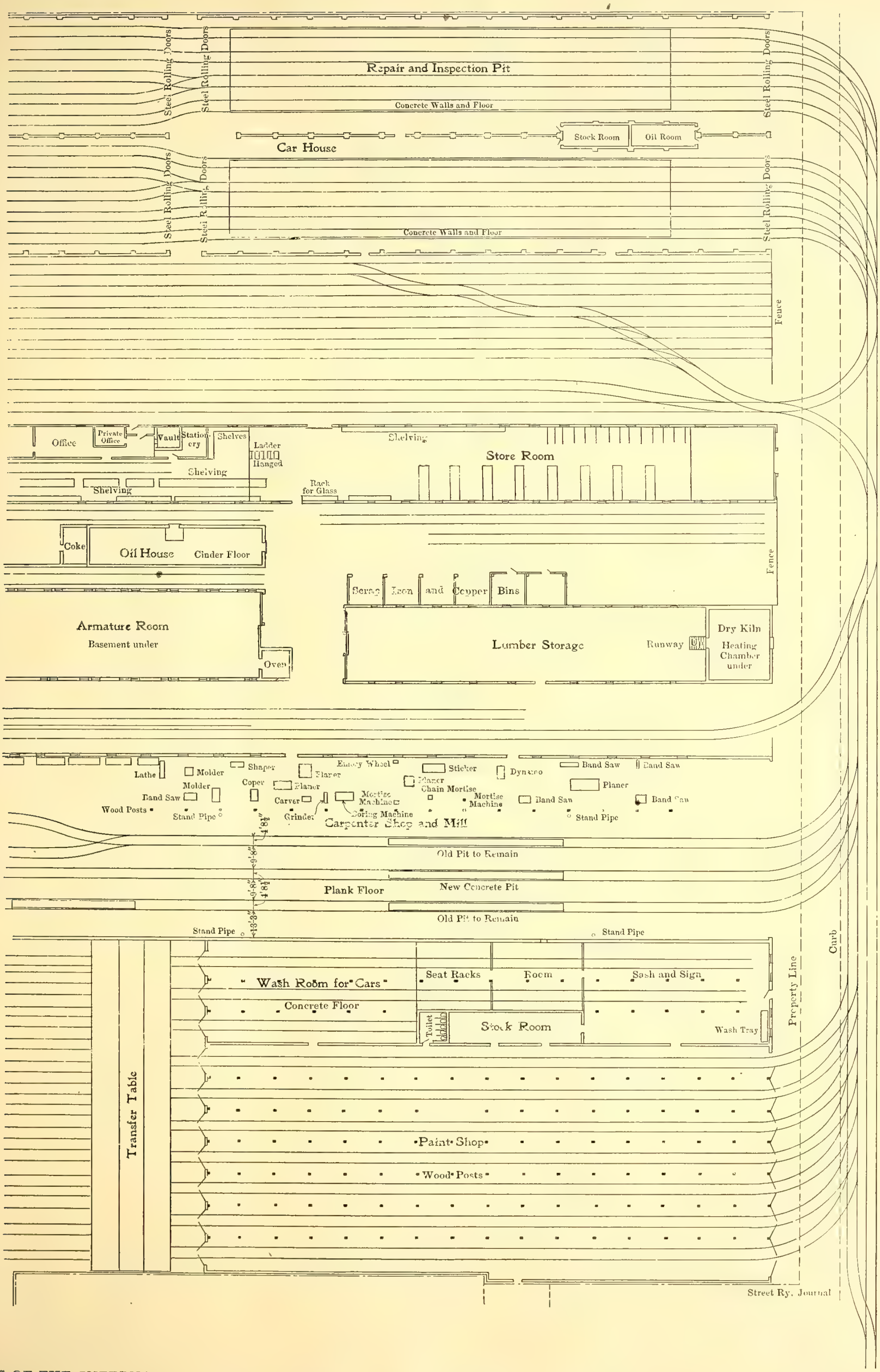
TWISTED RODS IN POSITION FOR CONCRETING TO FORM THE PIT PIERS



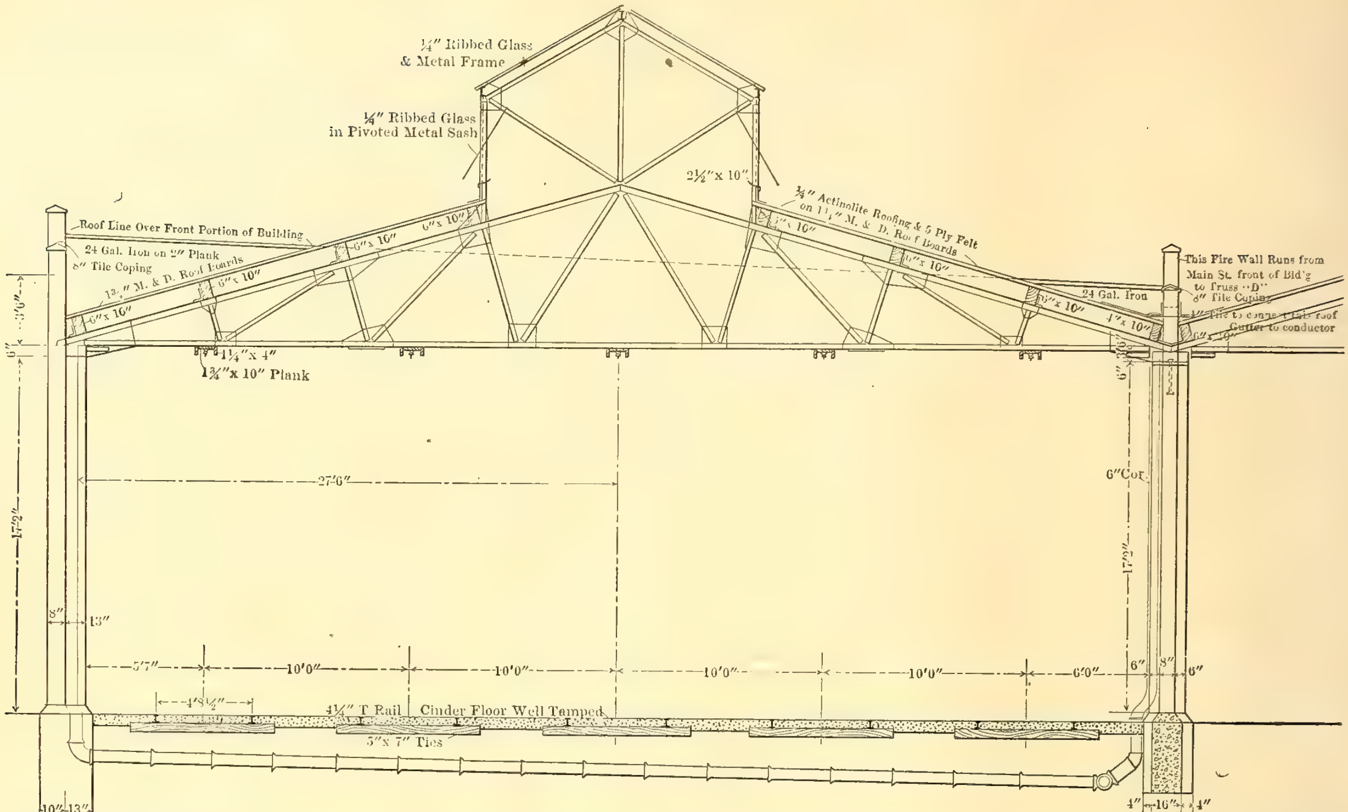
CONCRETE PIERS BEFORE THE RAILS, CHECKER-PLATES AND RADIATORS WERE INSTALLED



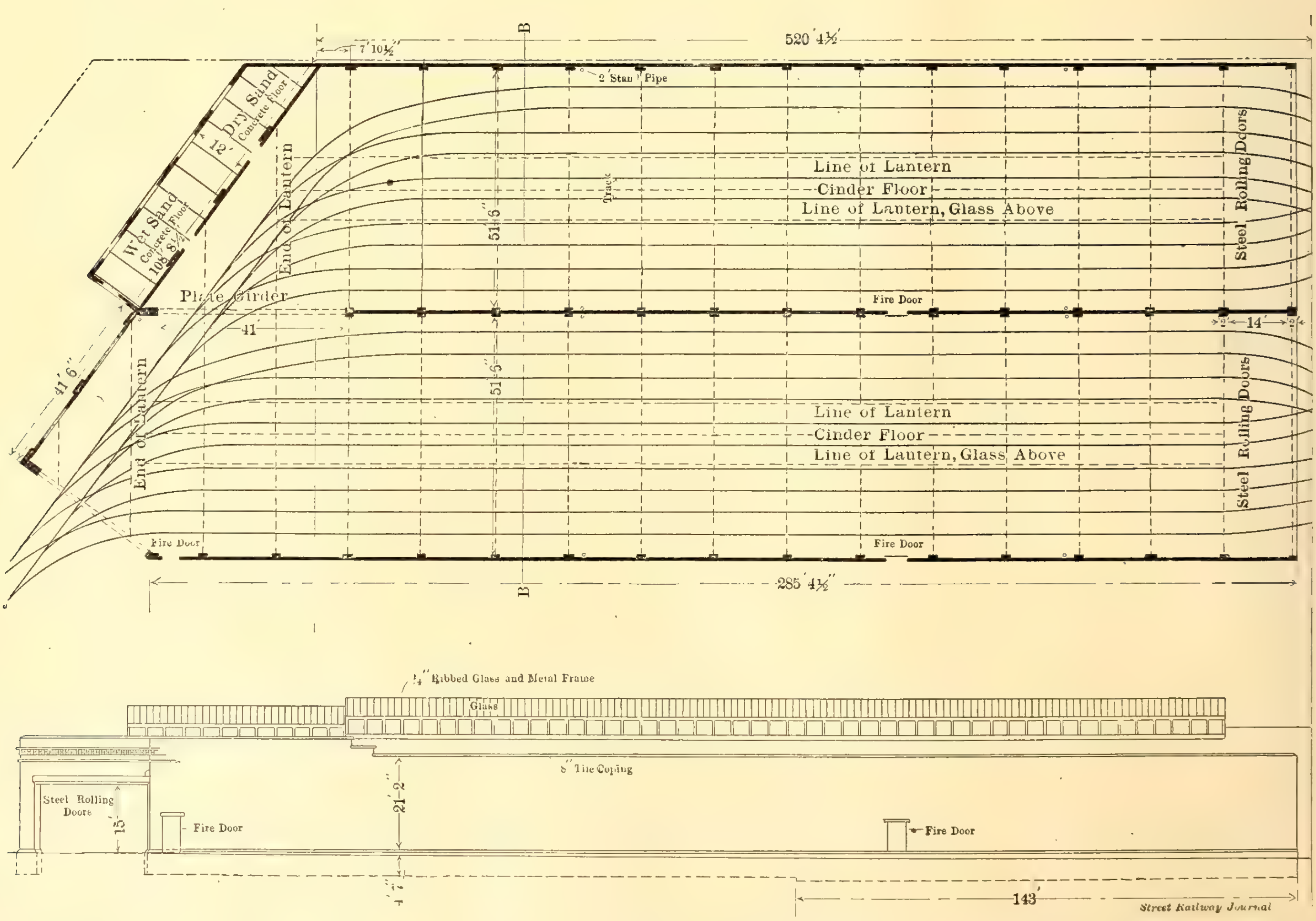
GENERAL PLAN, SHOWING THE NEW CAR HOUSE, REMODELED SHOPS AND THE CAR-STORAGE



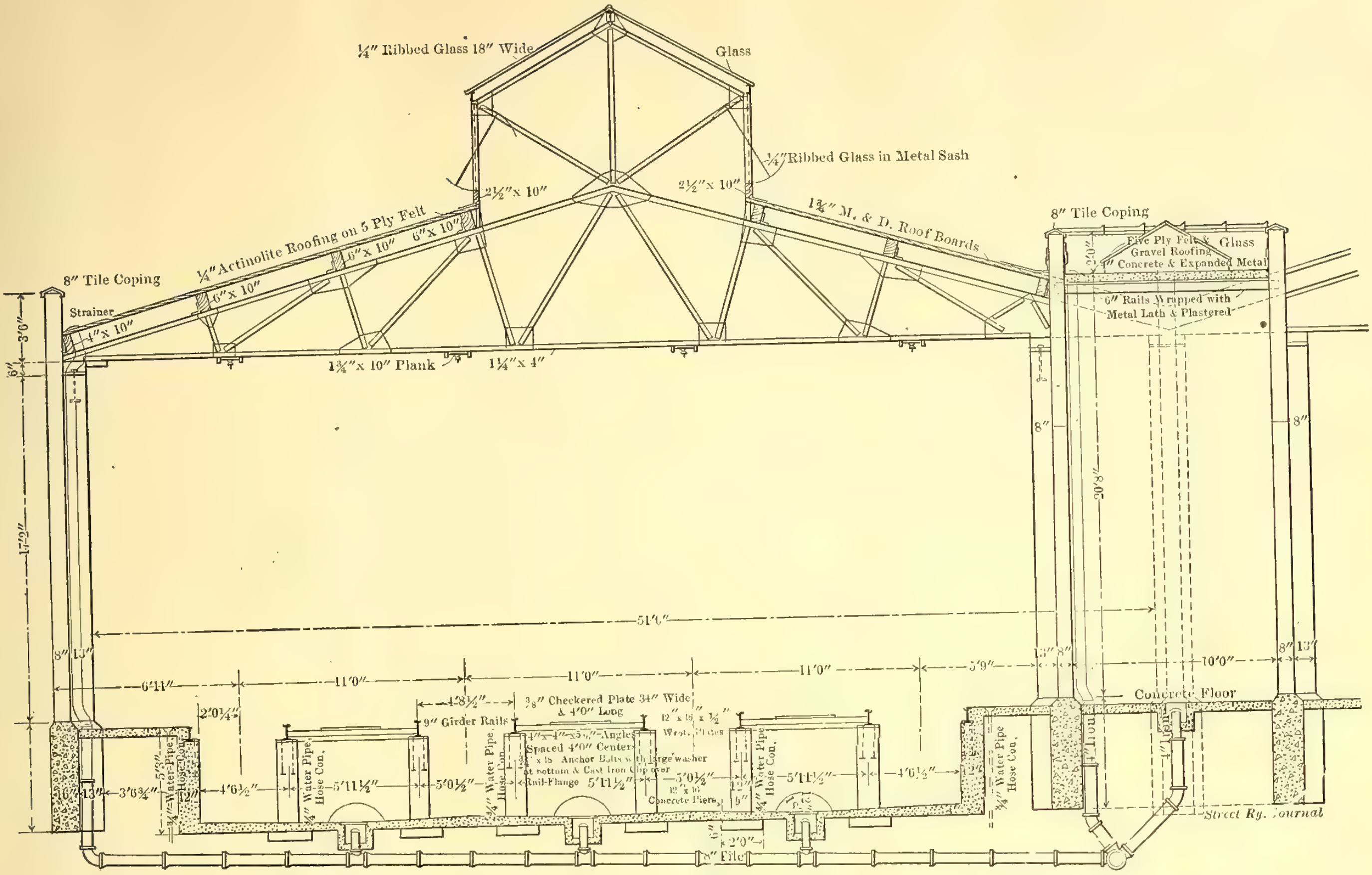
TRACKS OF THE INTERNATIONAL RAILWAY COMPANY AT COLD SPRING, BUFFALO, N. Y.



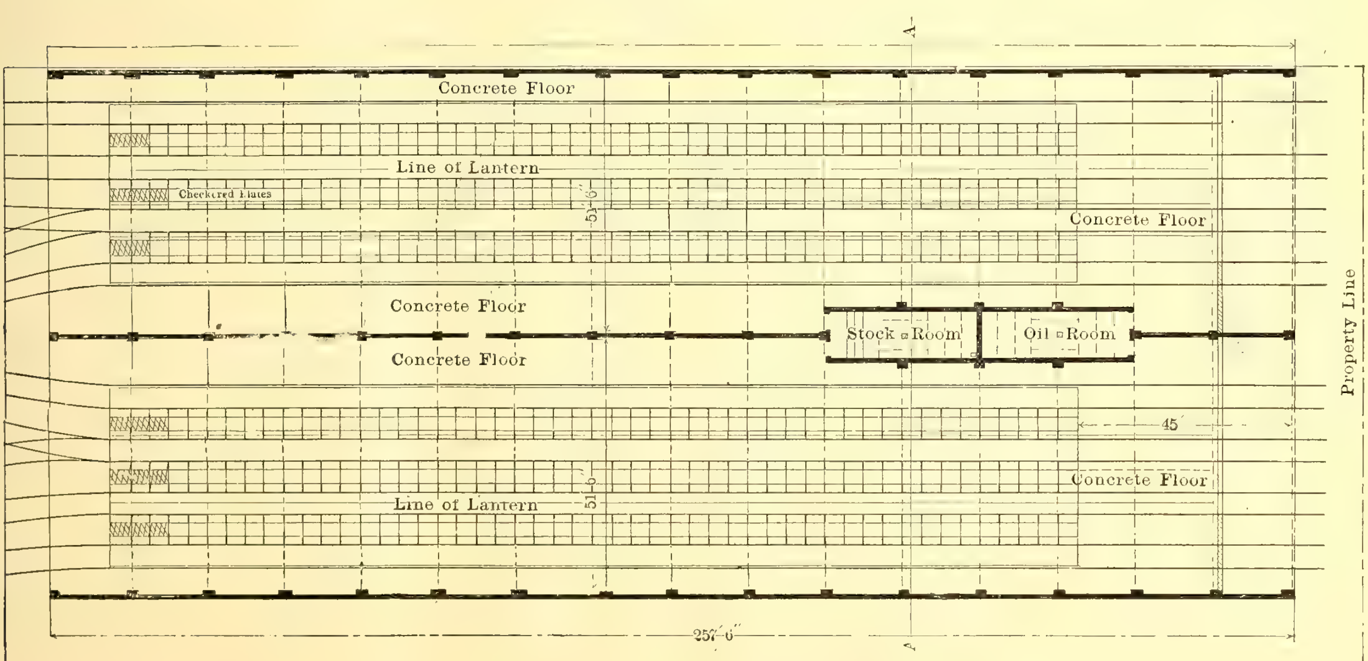
CROSS-SECTION OF CAR HOUSE ALONG THE LINE B-B ON PLAN, SHOWING DETAILS OF FLOORING, WALLS AND ROOF CONSTRUCTION

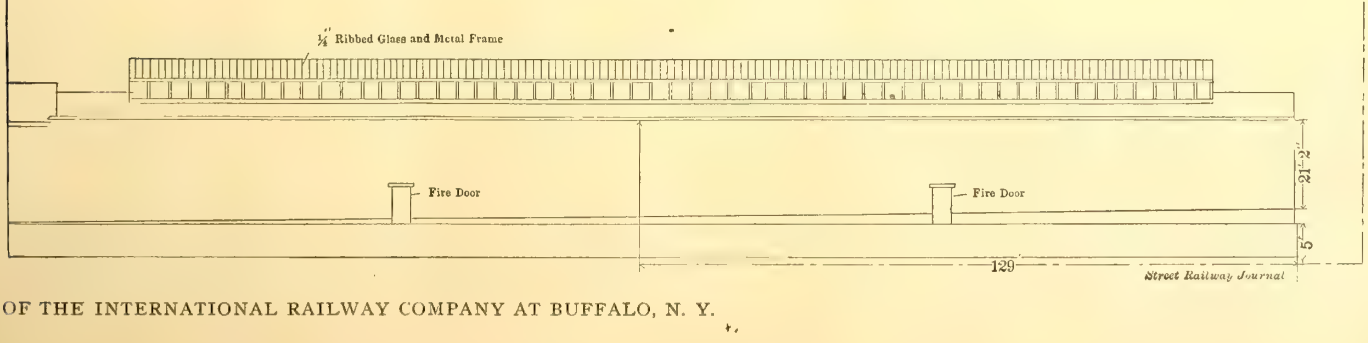


PLAN AND SIDE ELEVATION OF THE NEW COLD SPRING CAR HOUSE



CROSS-SECTION OF CAR HOUSE ALONG THE LINE A-A ON PLAN, SHOWING THE PIT DIMENSIONS, GIRDERS, ROOF DETAILS, ETC.





OF THE INTERNATIONAL RAILWAY COMPANY AT BUFFALO, N. Y.

of galvanized sheet iron formed over stiffening bars. These bars are spaced for 1¼-in. ribbed glass 18 ins. wide, and their lower ends rest upon channels at the top of the side walls. The sash in the sides of the skylights are made of heavy galvanized iron and are pivoted at the center of each side. All of them may be easily opened and closed, as ventilating conditions and weather demand, through a simple skylight gearing having operating levers on the walls. The roof conductors are 4 ins. x 6 ins., cast iron, and are leaded into the sewer inlets. At the top they are fitted with 16-in. copper conductor heads which extend through the roof, are turned down on the same and fitted with galvanized wire screens which project 3 ins. above the roof and prevent refuse from clogging the conductors. Around all the walls and skylights was placed a flashing of No. 26 galvanized iron, 6 ins. on the roof and 12 ins. up the walls. After counter-flashing this was cemented with oil cement.

In constructing the roofing, the roofing boards were covered with one thickness of dry felt, and over this were put four layers of No. 1 roofing felt weighing about 15 lbs. single thickness to 100 sq. ft. These layers were cemented, after which the roof was entirely covered with a coating of fireproof fibrous actinolite cement troweled on not less than ¼ in. thick.

The water supply is secured through a 4-in. main connected to the 6-in. city main in Masten Street. The stand pipes are run from this 4-in. main, as indicated on the plan drawing These stand pipes are of 2-in. galvanized iron, carried up close to the walls, securely attached with wrought-iron straps. At a height of 3 ft. above the floor they are equipped with a 3-in. hose valve, above each of which is a capped air chamber 12 ins. long. It has been found that greater efficiency is secured in car and truck washing by combining compressed air from the car reservoirs with the water from this piping, a pressure of 70 lbs. often being obtained. There is a swinging hose rack at each stand pipe which holds 50 ft. of 2-in. rubber line cotton hose in one length. Each line of hose is provided with brass couplings and spanner and a 12-in. brass nozzle.

One of the most commendable features of this car house is the pit construction. Each section of the rear half of the building contains four continuous pits 200 ft. long. The pits have a concrete floor and carry their tracks on 12-in x 16-in. concrete piers, spaced 8 ft. centers. Attention has already been called to the excellent natural lighting in this structure, but this illumination would be of trifling advantage if the construction were such that little light could reach that portion of the pits covered with cars. To prevent this the checkered-plate devil strip or walk between the pits is only 34 ins. wide, which allows, as the view on this page shows, a considerable opening on each side through which light can penetrate. The position of the devil strip also makes it convenient for men to work on the sides of a truck and makes it easy for the foreman to see just what his men are doing.

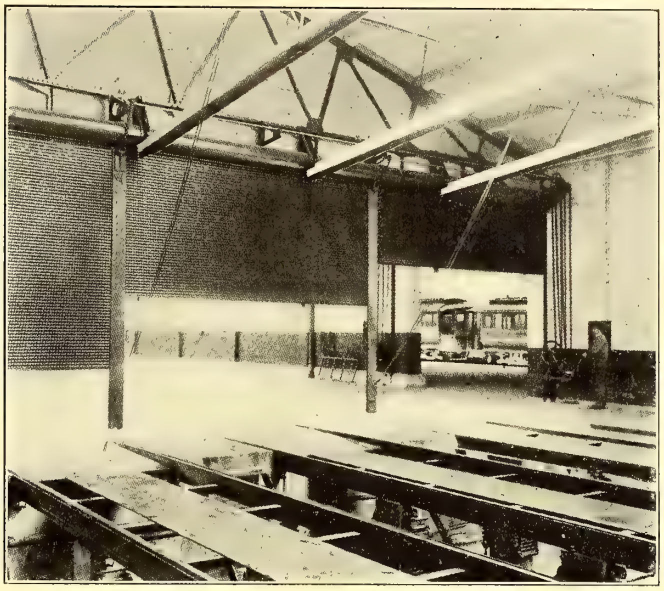
Steps made of checker plates are used at the ends of each pit for the convenience of the men working in them. In the

VIEW THROUGH THE CAR HOUSE, SHOWING THE PITS, CHECKER PLATES, RADIATORS AND SKYLIGHT CONSTRUCTION

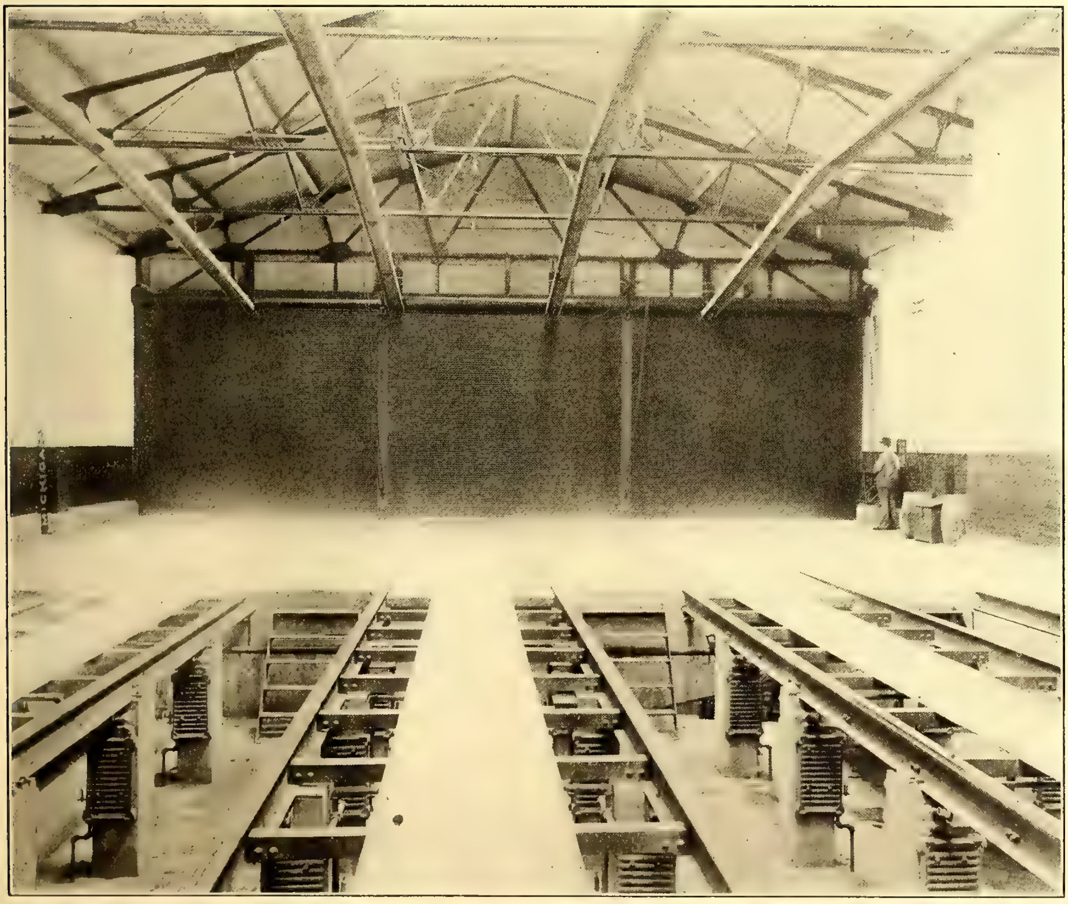
pits are used Watson-Stillman hydraulic motor lift jacks which when closed are 34 ins. high, and extended are about 6 ft. high.

Steam for heating the pits is delivered from the central plant under a pressure of 40 lbs. to the square inch, and is capable of heating the entire building to a temperature of 60 deg. F. when the outside temperature is zero. The main distributing pipes running under the floors are insulated with magnesia covering and encased in vitrified split tile large enough to permit at least 1 in. air space. At the supply and return end of each series of the wall radiators valves are placed. The valve on the return end is below the floor line and is protected by a piece of 6-in. pipe extending 1 in. below the line of the floor. The total amount of radiating surface exclusive of the mains is 41,000 sq. ft. The radiators, which are of the American Radiator Company's Colonial pattern, are divided into units of 7 ft. each, two of which are placed on each pit pier. Each unit is supplied with a duplex automatic air valve. Both the radiator and piping are thoroughly insulated. All condensation is returned through a Wright emergency steam trap located in a special pit and provided with a by-pass and draw-off with connections to sewers. The special pit is 6 ft. wide by 6 ft. long, and is several feet lower than the regular pits. It receives the reducing valve in addition to the trap. The top has a cover of iron checkered plate 3/8 in. thick. This plate is in an angle-iron frame and can be raised by two lift rings.

All of the conduits carrying the wiring for the pit lighting are of 3/4-in. iron and are imbedded in the concrete floor about 2 ins. below the surface. At all points where the junctions are made iron junction boxes are placed in the floor. These are 6 ins. in diameter and 5 ins. deep, with the conduit pipe entering the sides and flush with the inside of the box. These boxes have round brass covers 1/4 in. thick screwed to the iron flange of the junction box and flush with the top of the concrete floor. All of the outlets in the sides and back of the pit piers project 3/4 in. from the face of the latter and are provided with bent plate with rounded end, as shown in detail of pit construction, in which holes are punched to receive the lamp receptacles. Lead-cased wire is used for carrying the lighting current in the pits. Plug boxes are placed at the backs of the concrete pit piers at several points for attachment to clusters of five lamps which can be moved around for making close inspection of trucks or other parts. The lamps are of 16 cp and are placed on opposite sides of each pier. For the overhead lighting 50-cp lamps are used, five to six lamps being attached to each truss.



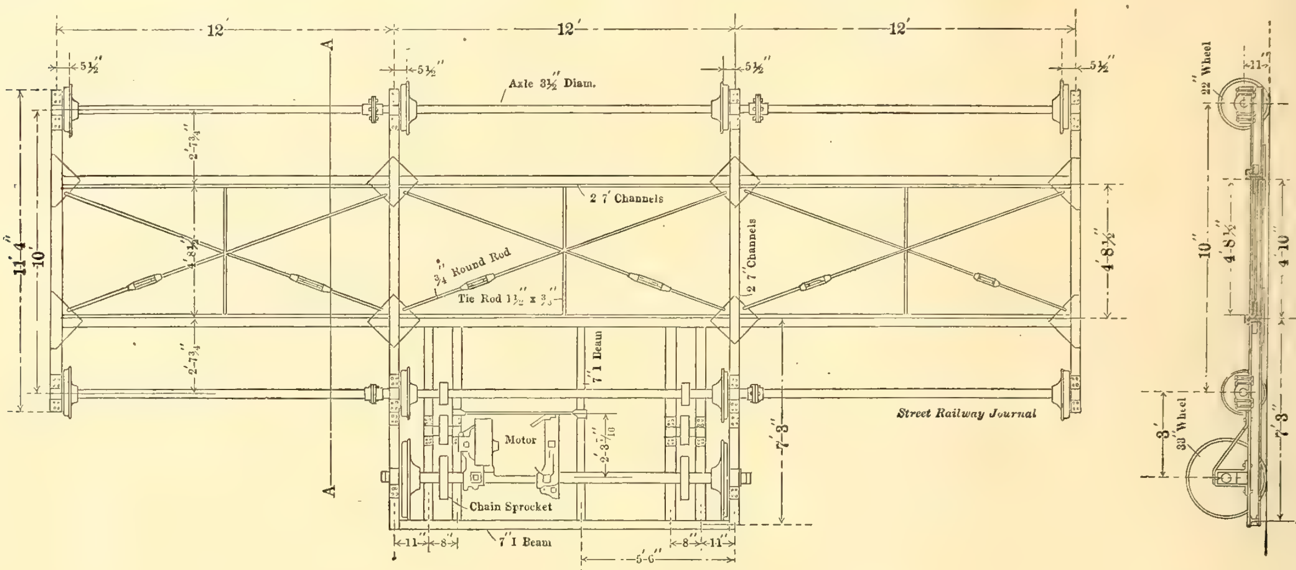
THREE STEEL ROLLING DOORS BEING OPERATED AT DIFFERENT HEIGHTS FROM ONE MOTOR AT THE RIGHT



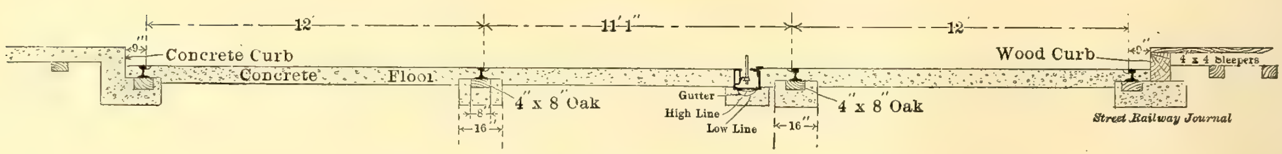
ROLLING DOOR AT THE REAR END OF THE CAR HOUSE, SHOWING ALSO DETAILS OF PIT CONSTRUCTION

In this building there are nineteen steel doors of the Kinnear type, to cover six openings 51 ft. 6 ins. wide by 15 ft. high and one opening 30 ft. wide by 15 ft. high. A decided novelty in connection with these doors is the use of electric motors for their operation. For this purpose 3-hp shunt-wound motors of the General Electric Company's CQ-3 type are used. Where fully a minute would be required to raise or lower a door by hand these small motors accomplish the same work in from twelve to fifteen seconds—a saving valuable almost any time, but especially in an emergency when

a lot of cars must be taken out of the car house quickly. Each of the larger openings is furnished with three doors of equal width, namely, 17 ft. 2 ins., with 2-in. posts between them. There is one door for the 30-ft. opening mentioned before.



TRANSFER TABLE



SECTION OF TRANSFER TABLE, LOOKING NORTH

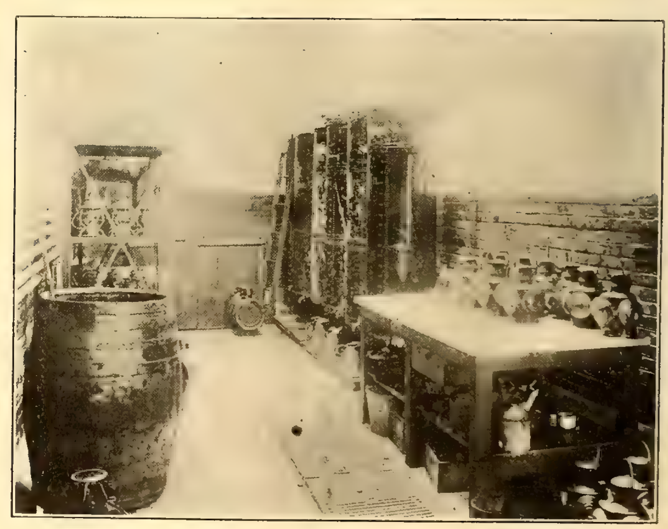
The two groups of three doors each in line across the building are controlled from one motor, through separate sets of operating levers, friction clutches and Jeffrey silent chains. One of the accompanying half-tones illustrates the possibility of letting down the doors in a group at different heights with the same motor.

All of the doors are constructed of No. 18 gage galvanized steel except the 30-ft. door, which is made of No. 16 gage galvanized steel. The shafts for the doors contain oil-tempered helical springs. These are enclosed in steel barrels sealed to protect them from atmospheric exposure. The doors are made of steel units hinged their entire length. This permits the use of heavy gages suitable for large openings, and requires less power to coil and uncoil them, due to the fact that the coiling movement occurs in the hinge and does not require the bending of the material. For the same reason, the door returns to its original form and hangs free in the grooves.

PAINT SHOP, STOCK AND MIXING ROOM

A sand drying room is located at the Main Street end of the building, convenient to out-bound cars. The sand is brought to the building in cars and is dried by a series of steam coils which contain about 2000 ft. of 1-in. pipe in all, and operated at a pressure of about 75 lbs.

It will be noted from the general plan that the oil and stock rooms, whose features of construction have already been mentioned, are located so as to be conveniently accessible from both sections of the car house and for receiving supplies from Masten Street. In line with the progressiveness manifested in the other features of this structure, the

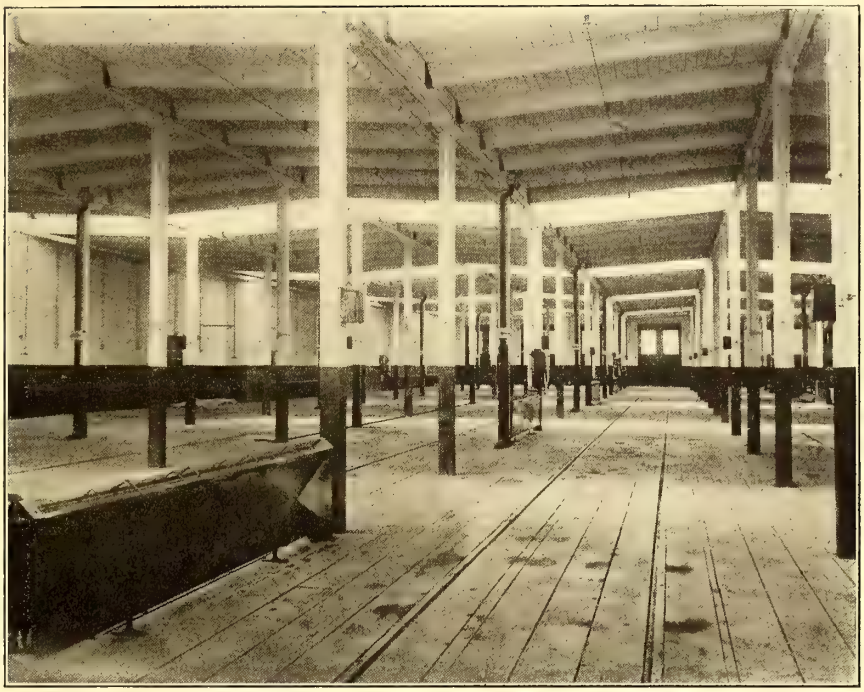


FIREPROOF OIL ROOM IN CAR HOUSE

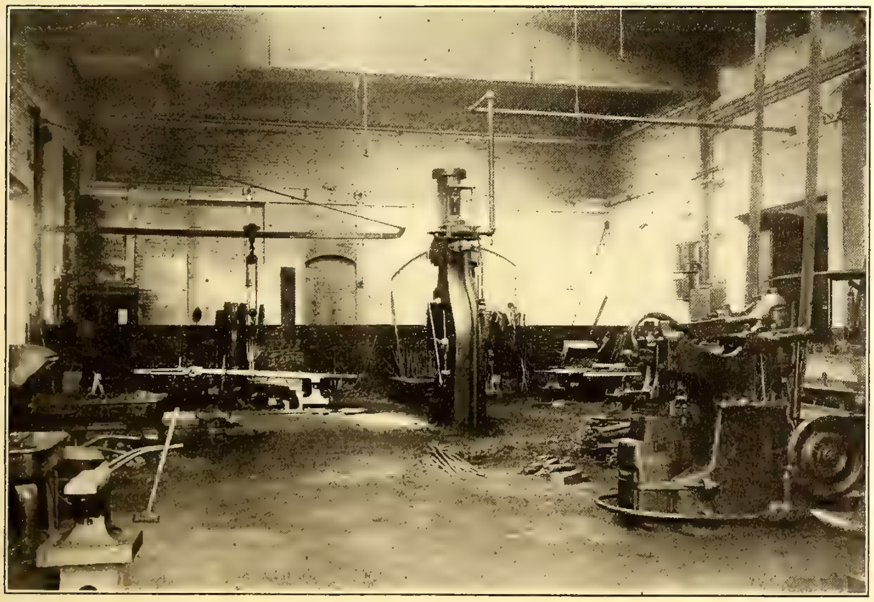
company has installed a large number of metal lockers of the Merritt type for the convenience of its employees in this and other buildings.

THE TRUCK SHOP

The truck shop is located in the western half of what was formerly the car house. New windows and skylights have been put in to get additional light, and the track system has been entirely changed to the layout shown in the general plan. The pits in this shop extend over the entire width of the building from the outside tracks and three-quarters of the length of the shop. They are built with 16-in. x 24-in. concrete piers spaced 7 ft. 9 ins. centers, which in turn support the track rails. These are 9-in. girder rails weighing 87 lbs. per yard, this weight having been chosen simply because a lot of rails of that size was in stock at the time. This weight was also used in the car house. At the back of these rails is located a 12-in. checker plate which can be removed to permit the dropping of bolts from the outside of trucks, and also for the convenience of men when working on the outside of the trucks. Next to the track rails these plates are supported by angle-iron attached to the track rails, and on the other side they are supported on old 6¼-in. girder rails kept in line by 1¼-in. tie rods. The floor between these rails is made of concrete and expanded metal 6 ins. thick, supported on the 6-in. rails and a 6-in. I-beam which runs the length of the pit between the rails. The heating of these pits is somewhat similar to that of the car house, with the exception that all returns are made accessible at all times by putting plates in grooves in the pit floors, these grooves being covered with checker plate 5 ins. wide. The lighting arrangement is similar to the car house.



INTERIOR OF THE NEW PAINT SHOP, SHOWING ALSO LINE OF SHEATHED HEATERS BETWEEN TRACKS



THE BLACKSMITH SHOP AT THE COLD SPRINGS DEPOT

The doors on the west, of Michigan Street, end and dividing the truck shop from the carpenter shop, as well as the doors on the south side of the transfer table, are of the steel rolling type used in the car house. The truck shop is furnished with four electric traveling cranes of the Northern Engineering Works low type, for handling cars and trucks. Each crane has two 7½-ton electric hoists. Two of these cranes are operated on one side and two on the other side of the shop. The bridge travel and the hoisting is done by motors, but the hoist travel across the crane is by hand. A row of iron columns through the center of the building supports one end of the crane track, the other being supported on the side walls of the building. On the row of columns through the center of the shop several jib cranes with air hoists are to be attached for handling smaller truck parts. The timekeeper's office, toilet and store room for car trimmings are adjacent to the truck shop in a very central location.

TRANSFER TABLE

The transfer table between the truck and carpenter shops is of special design for this service, and was built in the shops of the company. It has an underrunning trolley, and the total height of the table is only 8¼ ins. from the track it runs on to the track of the shop. This table will take cars from the storage yard to the truck and carpenter shop or vice versa. Its general features are shown in the illustration on page 12.

CARPENTER SHOP

The carpenter shop or mill is also located in the former car house at the east end. Additional skylights and windows were added and a 2-in. plank floor laid throughout. Two new concrete pits were constructed, 80 ft. long, and four of the old brick pits retained. The mill machinery is located so that the machines are very handy to the cars, and cartage of material over long distances is avoided. All machinery is run through belting from a large dynamo. At the west end of the shop are located the carpenters' benches and a pattern storage loft is over the timekeeper's office and toilet.

THE PAINT SHOP

The paint shop is on the south side of the property between

the car-storage yard and Masten Street. It has a capacity of about fifty cars. There is a washroom in connection with this shop in which six of the largest cars can be cared for at a time. Cars after being washed are shifted by means of a transfer table to the paint shop. They are then worked through the paint shop, coming out through the Masten Street end when finished. The building itself has brick walls and concrete foundations, with yellow pine roof framing. The lighting is by means of skylights 12 ft. wide, with hinged side sash placed at 35-ft. centers throughout the length of the building. There is a 2-in. plank floor throughout the shop. The artificial illumination consists of 32-cp lamps placed on each side of the posts of the building about 8 ft. from the floor. There are also plug boxes for portable clusters. The steam coils for heating this shop are in clusters of three enclosed at the sides with galvanized-iron casing and

BLACKSMITH SHOP STOCK ROOM, CONTAINING SHEAR AND PUNCH DIRECT CONNECTED TO MOTOR

with a wire screen at the top. This side casing prevents the heat striking directly against the car panels, and thus prevents their cracking or splitting. The doors at either end of the building are wooden with the upper halves of glass. The store room is made fireproof by brick walls and concrete roof and floor. The transfer table at the west end of this shop is of similar construction to that of the truck shop.

THE BLACKSMITH SHOP AND MISCELLANEOUS BUILDINGS

The blacksmith shop and iron storage room have been reconstructed and made fireproof. This shop is equipped with one 1100-lb. Bell steam hammer, a 100-lb. Bradley hammer, and three large and three small down-draft forges and one spring forge, all made by the Buffalo Forge Company. The supply and exhaust fans for these forges are run by an old railway motor located on a platform suspended from a roof truss. The iron room is furnished with racks for bar-iron storage and wall racks for templets. In this room is also placed a shearing and punching machine, which was formerly run by a belt, but is now equipped with a separate motor.

The power plant, which is used for heating the entire system and supplying steam for power uses, has been reconstructed. It is furnished with three 120-hp Lake Erie boilers run at a pressure of about 100 lbs. The pumps for returning condensation to the pumps are in a pit in the boiler room. The fuel bins are placed so that all coal can be brought in on cars. By means of ducts in the fans the shavings from the mill are blown to a bin in the boiler room, where they are used for fuel.

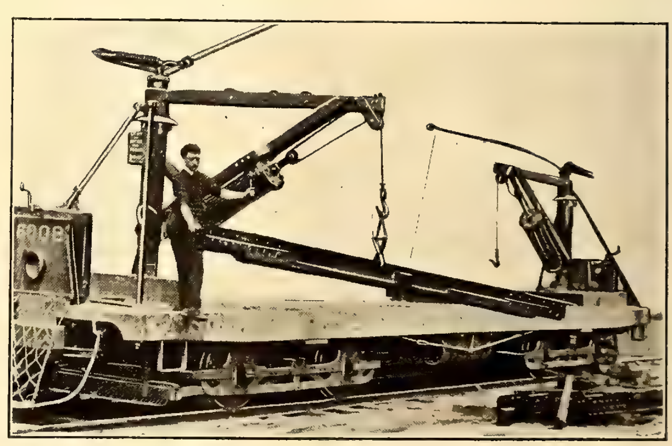
The machine shop, lumber-storage shed and dry kiln are to be erected at the places shown on the general plan. The master mechanic's office is now in a building which was formerly a sub-station. The store room is in the former carpenter shop and mill, which is a wooden building, and the intention is to construct a new fireproof building on this site in the near future. The fireproof oilhouse has been erected between the stockroom and armature room for the storage of oil and similar material. This is under the supervision of the storekeeper.

The car house was erected under a special contract, but the company is doing all of the other work directly. The entire undertaking has been designed and carried out under the supervision of J. W. Wilson, general manager of the company, Thomas Pumfrey being the engineer in charge.

CAR FOR HANDLING RAILS AND SPECIAL WORK

The Maintenance of Way Department of the United Railways & Electric Company, of Baltimore, is using a novel form of construction car for handling special work, rail and other heavy material. The illustration shows one of the cars of which four have been built. Each car is equipped with two cranes, which are provided with air hoists. The cranes have a capacity of 2000 lbs. each and will swing a distance of 8 ft. from the center of the car. The air cylinders for operating the hoists are 10 ins. in diameter by 40-in. stroke. The car shown is equipped with a 24-ft. air compressor and with two air reservoirs, so as to give ample storage capacity for storing the air used in connection with the air hoists.

The method of bracing the mast of the cranes is rather novel. Each mast is braced from the floor of the car by two 1-in. rods, which are enclosed in what is known as hydraulic tubing or hydraulic piping. This tubing is 1⅛ in. inside diameter and 1 15-16 in. outside diameter. It will thus be understood that the walls of the pipe are 13-32 in. thick, giving a very stiff pipe which, when used in the manner indicated, is ample to take care of any compression or tension stresses which may be thrown upon the braces when the hoists are in use. The car is 41 ft. 11 ins. over bumpers and 8 ft. 2 ins.



CAR FOR MAINTENANCE OF WAY DEPARTMENT AT BALTIMORE

wide. It is not intended to carry anything longer than 30-ft. rails upon this car, but these lengths may be handled readily as the distance between the masts of the cranes is 31 ft. 3 ins. The car is equipped with air brakes. The accompanying engraving shows the convenience with which a heavy piece of special work can be loaded or unloaded.

THE APPLICATION OF Y. M. C. A. WORK TO ELECTRIC RAILWAYS

BY E. M. WILLIS,
Railroad Secretary International Committee

The object of this paper is first to outline in brief the work that has been accomplished by the Young Men's Christian Association among the employees of the steam railroads in this country, and then to state what has been done in this direction among the employees of electric railways, and to forecast the possibilities for a larger work in the electric traction field.

Nearly thirty years ago an association for promoting the welfare of steam railroad employees was organized in Cleveland, Ohio, under the direction of the Young Men's Christian Association. Since that time the movement has grown, until there are now 215 Y. M. C. A. railroad associations at division points, junctions, and railroad communities, where the men spend their leisure time. The membership of these associations is over 76,000, with many men daily using the buildings, of which there are now 135, valued at $2,350,000. Many of these buildings are as well furnished as the average club house. The equipment includes well-appointed wash and bath rooms, barber shop, lunch room or restaurant, where good, wholesome food is served at a moderate cost, social and game rooms, including billiards, pool, bowling, and other attractions; well selected libraries; and good, comfortable beds in the dormitories. There are also auditoriums where lectures, informal talks, concerts, and other entertainments are given and where religious services are held from time to time. These buildings are arranged with the view of serving the needs of the men, so that when train employees reach the terminal they can go directly to the railroad building, and whether the lay-over be short or long, have a good, comfortable place to spend their time when off duty.

The usual cost of membership in these associations is $5 per year and the ticket of one association is honored in any one of the other railroad associations of the country. The buildings are under the direction of a general secretary, who gives all of his time to the welfare of the men and seeks in every possible way to help them as occasion may require. Generally the undertaking is in charge of a committee of management, consisting of officials and employees, and this committee has the direct oversight of the work of the general secretary. The general supervision of the railroad associations is, to a considerable degree, under the direction of the Railroad Committee of the International Committee. This committee assigns secretaries to the railroad systems in various parts of the country, and it is the duty of these secretaries to look after the associations on the roads to which they have been assigned and to help maintain the standard, so as to secure unity in plan and action for the associations as a whole. The work of these secretaries is directed by a committee of business men prominent in the steam railroad world. The chairman of this committee is John J. McCook. The other members are Charles F. Cox, Dr. John P. Munn, William A. Patton, and B. D. Caldwell, with Morris K. Jesup as

RESTAURANT, DOWNTOWN BRANCH STREET RAILWAY Y. M. C. A., AT ROCHESTER

BARBER SHOP, DOWNTOWN BRANCH STREET RAILWAY Y. M. C. A., AT ROCHESTER

ONE OF THE REST ROOMS, DOWNTOWN BRANCH STREET RAILWAY Y. M. C. A., AT ROCHESTER

advisory member. The work of this committee is supplemented by state committees and secretaries in many States. The appreciation and interest on the part of railroad officials is increasing year by year, and at points on roads representing over 80 per cent of the entire mileage of North America the Railroad Young Men's Christian Association work is now organized as a recognized and valued betterment.

The recent developments, as applied to electric railways, have brought the association work to the attention of electric railway officials. Electrical equipment is being rapidly improved and interurban electric lines are now reaching out in all directions over the country, with longer runs and larger forces, so that more time at the end of the run is given the men for lay-overs. These conditions have given occasion for the consideration of the association by electric railway men. Moreover the acquirement of electric railway properties by steam railroad interests is serving to form a link between the work of the association in the steam railroad field and the movement as applied to the newer electric traction industry. There are now several very successful electric railway Y. M. C. A. associations, which will be mentioned later, and a number of other companies are planning to establish branches on their roads.

SOCIAL ROOM, DOWNTOWN BRANCH, STREET RAILWAY Y. M. C. A., AT ROCHESTER

READING ROOM, STREET RAILWAY Y. M. C. A., AT MEMPHIS

As to the value of this work to the companies and men, it may be said that a well organized railroad always looks carefully after its rolling stock, rails, roadbed, and other property, and repairs and improvements are constantly being made. It would seem that if it is worth while to repair the rails, it is equally worth while to do something for the men. If the motormen and conductors are to be courteous, neat, and gentlemanly in their conduct, a place where they can be under good influence when off duty is very desirable, and the association provides such a place. As indicated, association buildings are fully equipped with all that is essential to a man when off duty. If he spends his leisure time in the rooms he will be in a better condition when called for service than if, as is very often the case, the time is spent in the saloons which abound in the vicinity of any railroad terminal.

Wherever one of these associations has been organized, it has very seriously affected the business of the saloons in the vicinity, and in several instances has been the means of reducing their number. This is inevitable because the majority of men in the street railway employ are anxious for betterment and will take advantage of a respectable place where they may spend their leisure time.

One of the great elements of success in the organization is that it is based on Christian principles. In the early stages of its life fear was sometimes expressed that this fact might hinder its largest development. Experience, however, has demonstrated that there is no need for anxiety in this direction, for every man, whether he be Jew or Gentile, whether he has a belief in religious things or otherwise, if he is a man who is disposed to be decent, has the full privileges of these associations. In other words, every employee who is trying to make himself a respectable, law-abiding citizen is welcome to the ranks of membership. Sometimes it is doubted whether the men will coöperate in a plan which is endorsed by the company. Here also experience shows that the Railroad Young Men's Christian Associations bring about the coöperation of both men and employees.

Local associations can be organized in one of several ways. Frequently railroad employees will learn of an association at some other point, and will draw up a petition asking the officials of the company to coöperate in installing such a work at a particular center. In other instances, the railroad company anticipates the men, and asks for an investigation by the International Committee of certain terminals or points on a particular system where a large number of men are congregated.

Generally the company is asked to erect or fit up a building for the use of the men, to make a monthly appropriation of $100 per month, and to care for rent, light, and heat of the building. The men are asked to become members at the rate of $5 per year, and that amount, with the receipts from the restaurant, dormitories, and contributions of the company, generally gives sufficient funds to carry on the work successfully. Where there is no local constituency, as in a purely lay-over point, it has sometimes been deemed unwise to form a permanent committee or board. In such places a provisional organization is formed, with a chairman and treasurer, who, in connection with the general secretary, become responsible for details. Wherever local conditions warrant, a more permanent organization is effected with a full committee of management, consisting of president, vice-president, recording secretary and treasurer. The president and treasurer (or chairman) are often officials of the railroad company. The

general secretary is the executive officer, and has charge of the plans and details connected with the association.

Effective organizations among electric railway men have thus far been established at Rochester, N. Y.; Richmond, Va.; Memphis, Tenn., and Birmingham, Ala.; at all of which places a most satisfactory and aggressive work is carried on. At Rochester the Rochester Railway Company has recently opened up a second Y. M. C. A. branch in its downtown car house for the use of the men who have lay-overs in that

STREET RAILWAY Y. M. C. A. BUILDING, VIRGINIA PASSENGER & POWER COMPANY

part of the city. The Rochester company has a well-equipped all-round association, and the building is frequented by the men at all hours of the day, with an average daily attendance of over 400 at the rooms. Over 250 luncheons are served every day at the lunch counter. The association in Rochester has been very successful in competing with the saloons and pool-rooms, and one of the public pool-rooms directly opposite the car house has gone out of business. The welfare work at Rochester includes sleeping accommodations, barber shops, bowling alleys, lunch counters, etc.

At Richmond, Va., the Virginia Passenger & Power Company has a well-equipped club house at Reservoir Park, which is the terminal of one of the electric lines. This branch has a membership of 706, and an average daily attendance of over 300. There is in this building a small, but attractive, library, given by Miss Helen Gould, which is used by the men very largely. While it contains books on all subjects, the library is especially equipped with books of an electrical character. The work at this point has so prospered that a branch has been opened by the same company at Petersburg, Va., on the other end of the line. (The Y. M. C. A. work that has been accomplished in this vicinity was described in the STREET RAILWAY JOURNAL for June 4, 1904.)

At Memphis, Tenn., the association has been organized less than a year, and has at present a membership of over 600. In the judgment of the street railway officials at this point the association has materially increased the efficiency of the men in the service.

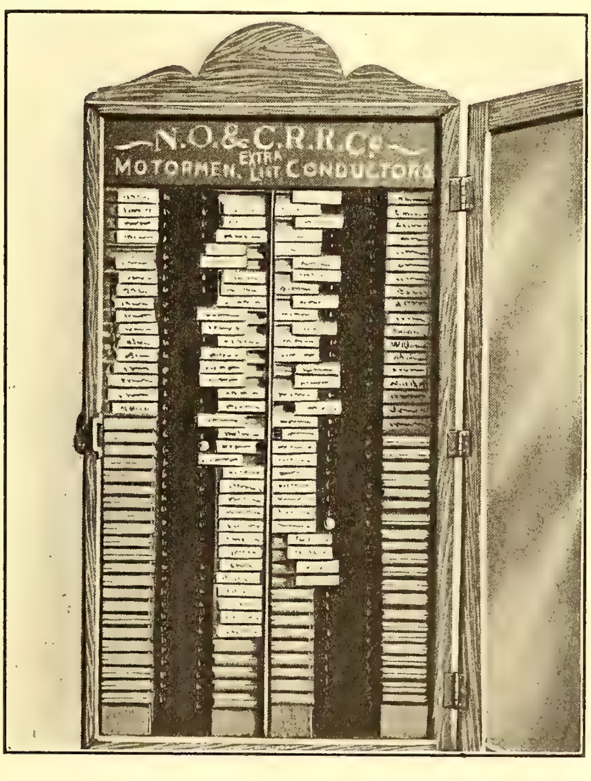
As an example of what this association has done, the following instance is cited. In February, 1906, at a meeting of the Newman Properties Association, composed of officials of the various electric railway properties in the South (including the road at Memphis), controlled by the Newman interests and managed by Ford, Bacon & Davis, an opportunity was given for a representative of the Street Railway Y. M. C. A. at Memphis to present the value and advantages of the work. The matter was then informally discussed, after which the officers unanimously voted to aid in establishing similar associations at each of the points represented. One of the officials present had made a careful study of the clubs for welfare work for street railway men in some sixty cities, and prepared a paper embodying his views on this subject, but the value of the Y. M. C. A. had so impressed him that he decided to withhold his paper, and voted heartily instead in favor of following up the work of the latter organization.

As a result of this conference, an association has just been opened at Birmingham, Ala., in the car house of the Birmingham Railway Light & Power Company, which is one of the Newman properties. Several rooms in the car house will be converted for reading, socials, entertainments, baths, pool and billiards and other games. It is also proposed to furnish dormitories for the benefit of unmarried men in the employment of the company.

At a number of places in this country this plan is now being considered, and it is expected that a number of electric railway companies will inaugurate the work of the Railway Young Men's Christian Association in the near future.

HANDLING THE EXTRA BOARD

The practice followed by the New Orleans Railway & Light Company in handling the extra board is somewhat unique. The names of the men that are on the extra list are placed on small wooden slides, which are arranged in columns of grooves within a shallow box, as indicated in the half-tone engraving. At the side of each slide is a hole to accommo-



EXTRA BOARD, NEW ORLEANS RAILWAY & LIGHT COMPANY

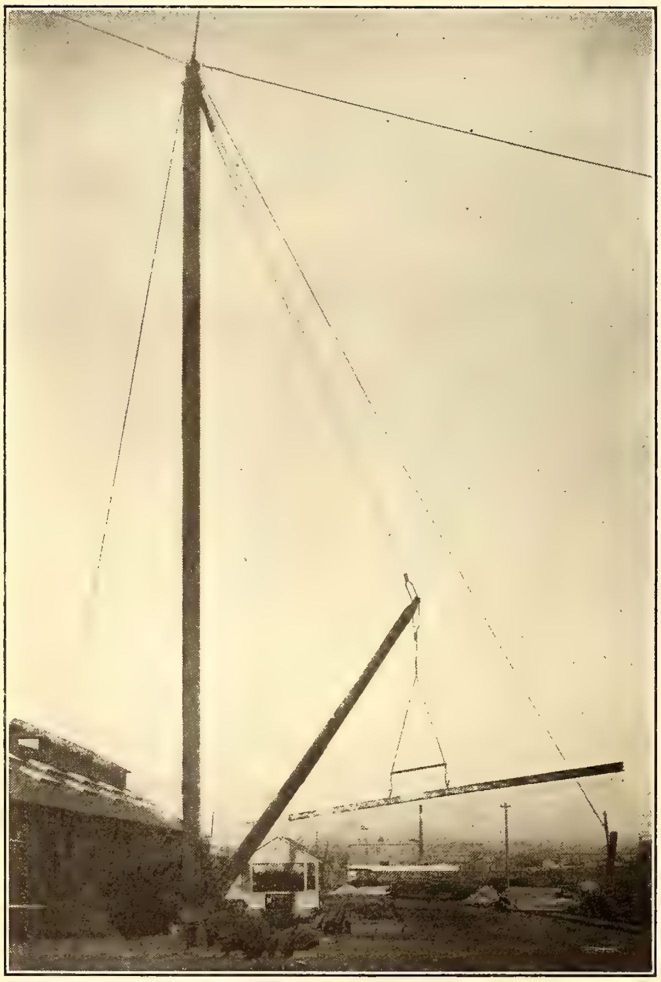
date a small movable peg. When a man is working, his slide is pushed in, so that the names that are pushed out indicate the men who are to receive work. The peg starts at the top of the column of names and is gradually worked down the board as the men are assigned to runs, that is, the peg always passes the names that are pushed in, and stops at the first name that is pushed out. The man who has the peg is the first man to get the next vacant run. In order to be posted on the board, all extra men must report for roll call three times a day, namely, at 5 a. m., 11:30 a. m., and 3:30 p. m.

The working board is made up immediately after each roll call.

The practice, with reference to handling the regular runs, is to post the list of runs at the end of each month, and the regular men then pick their choice of run, according to seniority. The runs are then entered in a book, together with the name of the regular crew assigned to each run. If a regular man asks off, his run is assigned to the first extra on the list, and the name of the extra man is entered at the side of the run number, to indicate who is working for the regular.

DEVICES FOR SHOP YARDS AT BALTIMORE

The United Railways & Electric Company, of Baltimore, Md., has in the yards adjacent to its Carroll Park shops a number of labor-saving devices especially designed to expedite the work of unloading heavy material from freight cars. A spur steam railroad track runs directly into the yards, and considerable thought has been given to the matter of reducing to the minimum the time and labor consumed in delivering material to the points of distribution.



DERRICK FOR UNLOADING RAILS AT YARDS OF THE UNITED RAILWAYS & ELECTRIC COMPANY, OF BALTIMORE

For handling short and long rails, special work and other bulky castings and material, the powerful derrick shown in one of the engravings has been erected. This derrick is operated by electric motor, and has materially reduced the cost of handling heavy shipments. It has been of particular value in unloading and loading long rail sections.

Another exceedingly useful device is the rigging illustrated in this connection for unloading car bodies from steam railroad flat cars. (This device was described in the Street Railway Journal for Sept. 5, 1903, but the accompanying engraving is shown herewith to indicate the method of actually handling a car body). The rigging consists of four heavy uprights, two on each side of the track, with a heavy channel girder connecting the tops of each pair. On these girders run small traveling trolleys, from which depend chain block and fall. In unloading a body, the flat car with the car body in place is run under the rigging, the body is raised by means of the hand cranes, the flat car is then run out of the way, the motor trucks are pushed under the suspended body, the body is lowered onto the trucks, and then can be easily moved into any portion of the shops. The rigging was of particular assistance in unloading the shipment of 200 new cars recently received for service on the United Railways & Electric system.

RIGGING FOR UNLOADING CAR-BODY FROM STEAM RAILROAD FLAT CAR, BALTIMORE SHOP YARDS

STEAM—ELECTRIC COMPETITION IN INDIANA

Some of the steam lines in Indiana have concluded to compete with the interurban railroads in Sunday excursion business. In some instances they have announced a rate considerably less than that charged by the interurbans. As an example, the Pennsylvania line is running a Sunday excursion from Richmond to Dayton, O., for 75 cents for the round trip, as against $1 charged by the electric railways. Other steam roads in the State having similar competition have advertised Sunday excursions at cut-rate tariff. The steam roads contend that they give the fastest time and cheapest rate. The arguments advanced by the interurban roads are that their service is more frequent and that riding over their lines really is a pleasure, for dust and cinders are unknown to the trolley.

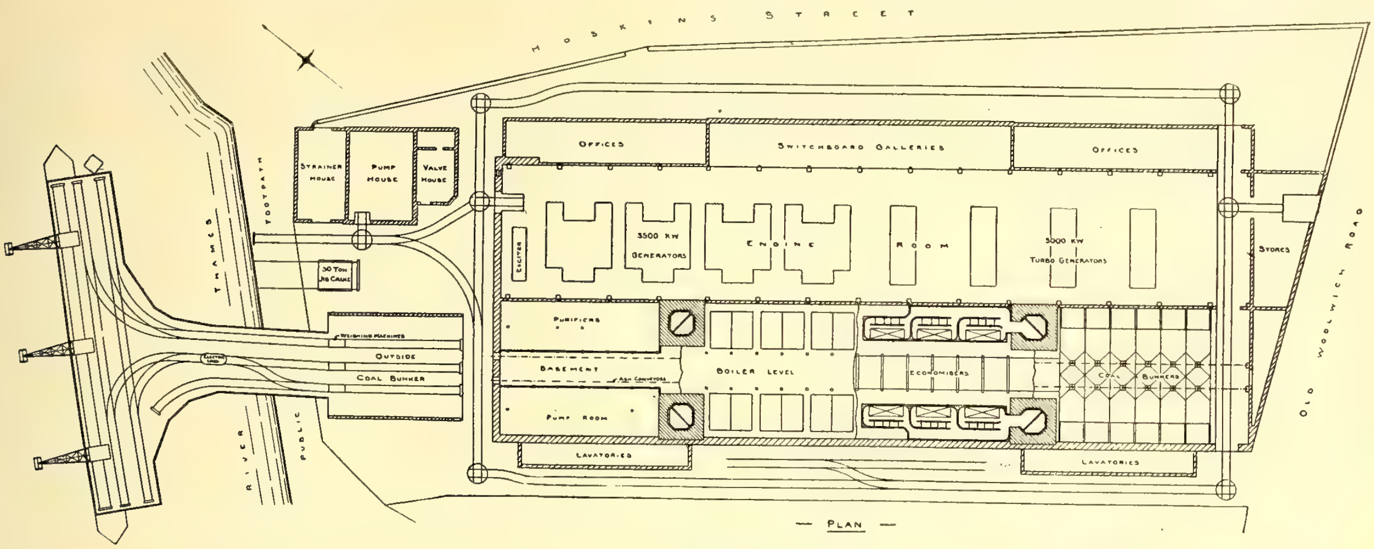
The idea of utilizing old horsecars for consumptive patients has been carried into practical operation in Leith, Scotland. In a field with a southern exposure near the Pilton Hospital for Infectious Diseases four old cars have been stationed. Very little has been done to them. Merely the window glass has been knocked out on the south side, and one of the seats fitted up for two bunks. Not a penny has been spent in painting or in any unnecessary work. On the top of the cars the fixed seats are cleared off, and garden chairs placed ready for the patients when the weather is sufficiently favorable to allow of them sitting without shelter.

GREENWICH GENERATING STATION FOR LONDON TRAMWAYS

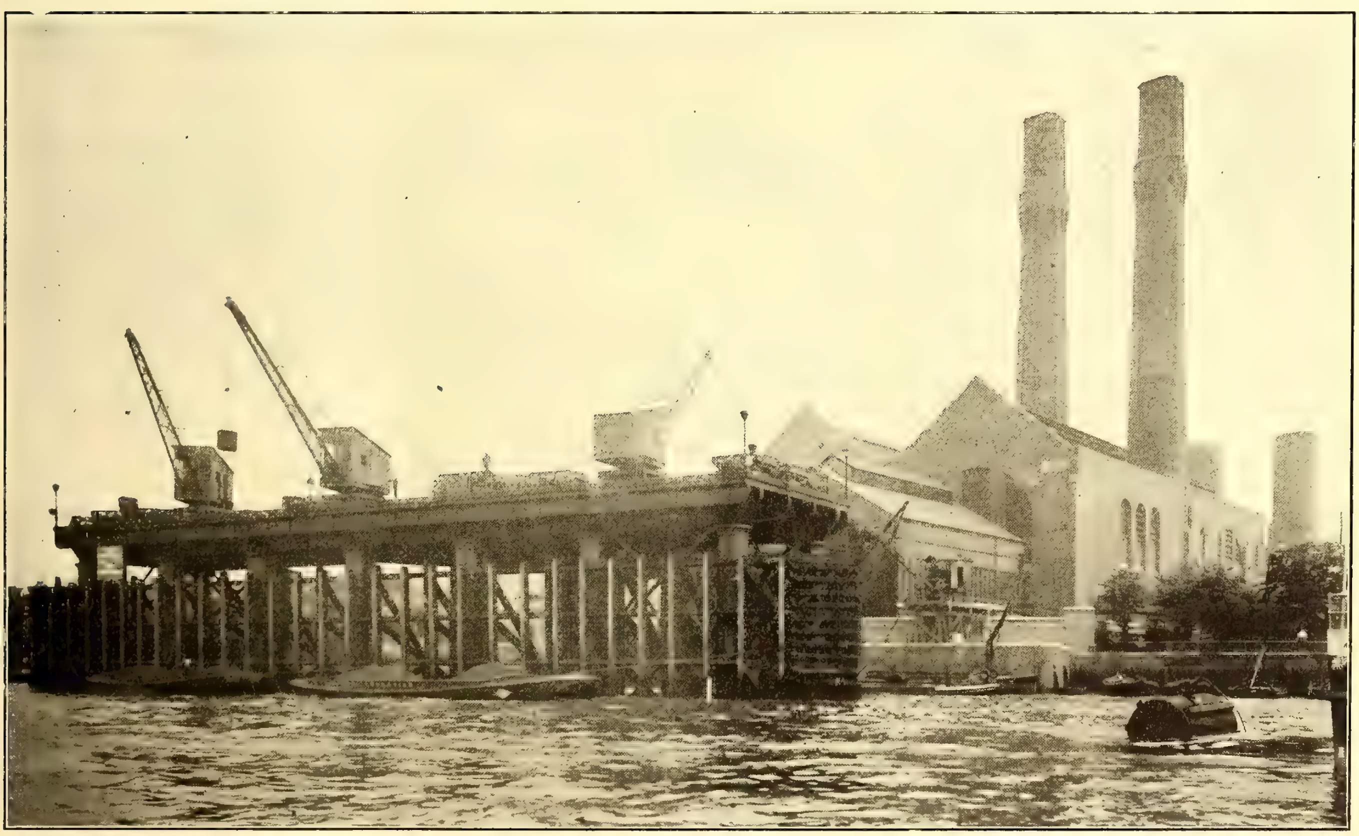
On May 26 the London County Council formally opened for operation the city's first power plant for the supply of power to the London municipal tramway system. Hitherto current for these lines had to be purchased from local power companies. For the station site the Council utilized the Greenwich tramway depot and land adjoining.

The station, which was designed to supply energy for the whole of the present tramways and early extensions, will be one of the largest in England. The ultimate capacity will be about 52,000 hp. Current is generated at about 6600 volts three-phase, and is transmitted by underground cables to various sub-stations. At these sub-stations it is reduced by rotary transformers to 550 volts direct current. Sub-stations have been provided at Clapham, Streatham, Brixtonroad, Elephant and Castle, Camberwell, New Cross and Greenwich. Other sub-stations are now in course of erection.

The Greenwich sub-station is part of the site of the generating station and adjacent to the first portion of it. The sub-station building ultimately will form part of the second portion of the generating station. The work of erecting the sub-station was carried out concurrently with that of the superstructure of the first portion of the generating station, and by the same contractors. The general arrangement of the generating station was designed by the Council's architect in consultation with the tramways electrical engineer, and the building was erected under the supervision of W. E. Riley, the Council's architect, and equipped under the supervision of A. L. C. Fell, the Council's chief officer of tramways, and Mr. Rider, the tramways electrical engineer. The



PLAN VIEW, SHOWING THE LOCATION AND DIVISIONS OF THE GREENWICH GENERATING STATION

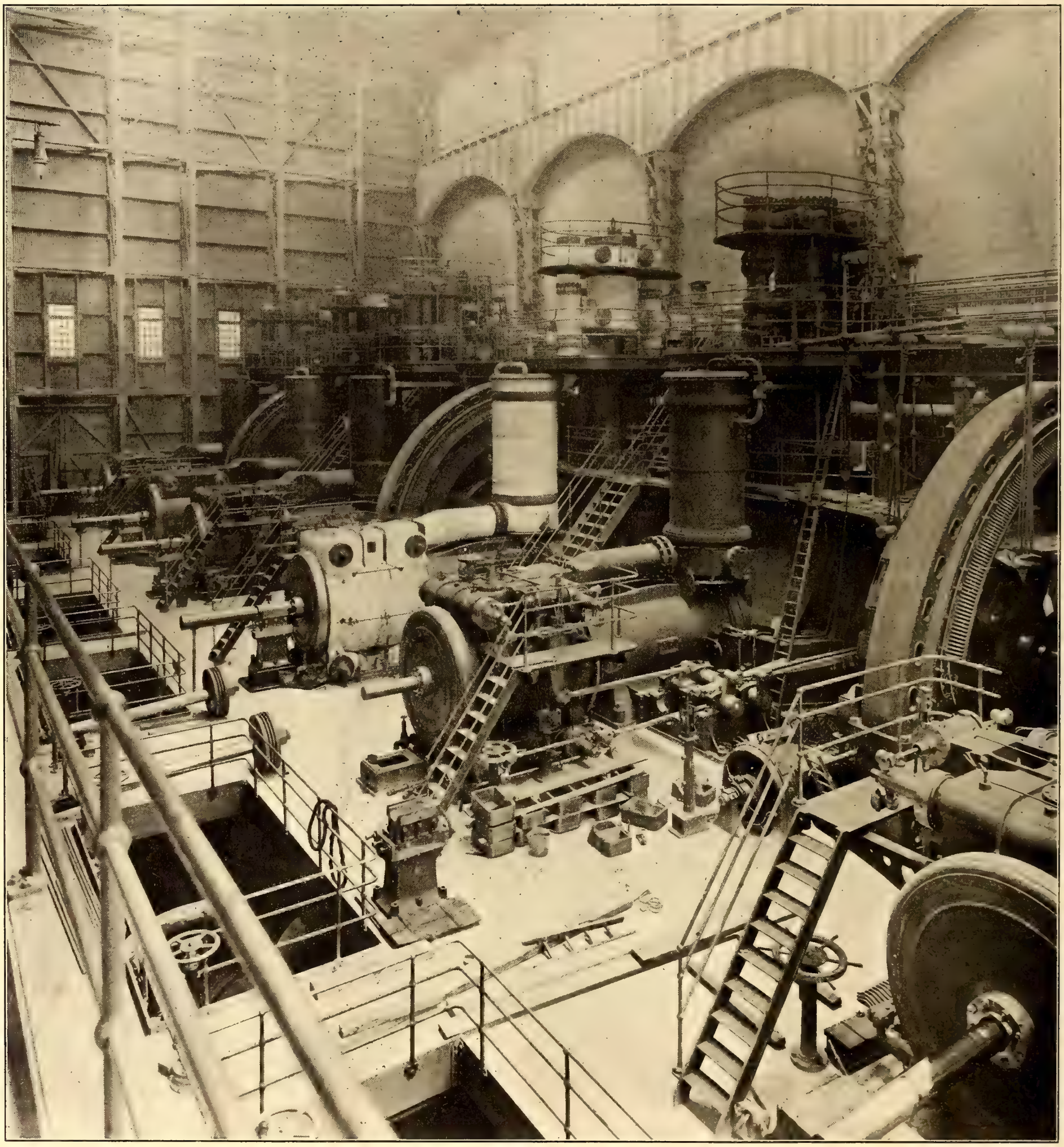


THE GREENWICH POWER PLANT FOR THE LONDON COUNTY COUNCIL TRAMWAYS, SHOWING ALSO THE COAL-HANDLING DOCK AND MACHINERY

pier and condensing water pipes were designed and erected under the supervision of Maurice Fitzmaurice, the Council's chief engineer.

The site is on Thames River, at Greenwich, covering approximately 3¾ acres, with frontages to the river of 240 ft., to Hoskins Street of 648 ft., and to Old Woolwich Road of 300 ft. The principal entrance is in Hoskins Street, where the general offices are located. Other entrances are in Old Woolwich Road, and there is an approach for the conveyance of material from the river wall. The building is in two parts, the first of which is now completed; the second part is in progress, and is at present separated from the first by a temporary corrugated iron screen. The complete structure will measure about 475 ft. x 195 ft., and about 80 ft. in height.

The general arrangement of the station consists of a boiler-house, engine-room, offices, sub-station, workshop, pump and strainer houses, outside coal bunker, and a pier for unloading purposes. The ashes from the furnaces are removed by the conveyors on their return journey, and are shot into barges at the wharf. The steam is generated in Stirling boilers and conveyed to the engines (four of which are erected in the first portion), giving a total of 26,000 hp. The current generated is passed to the switchboard galleries adjoining the engine-room, and distributed to the various sub-stations. The sub-station for the particular section of tramways near the generating station adjoins the switchboard galleries.



A VIEW OF THE INTERIOR OF THE GREENWICH POWER PLANT

There are administrative offices, stores, mess-rooms, bathrooms, and sanitary arrangements for the whole of the staff employed. At the northeast corner of the site a strainer-house and pump-house have been placed, and a partial supply

of water has been obtained by an artesian boring into the chalk. The principal function of the pump-house is to obtain a supply of water for condensing the steam after it has passed through the engines, the condensed water being used again for the production of steam. The water before entering the boilers is partially heated by economizers. There will be four chimney shafts. Those already erected rise to a height of 250 ft., with an internal diameter of 14 ft.

BOILER ROOM OF THE GREENWICH GENERATING PLANT

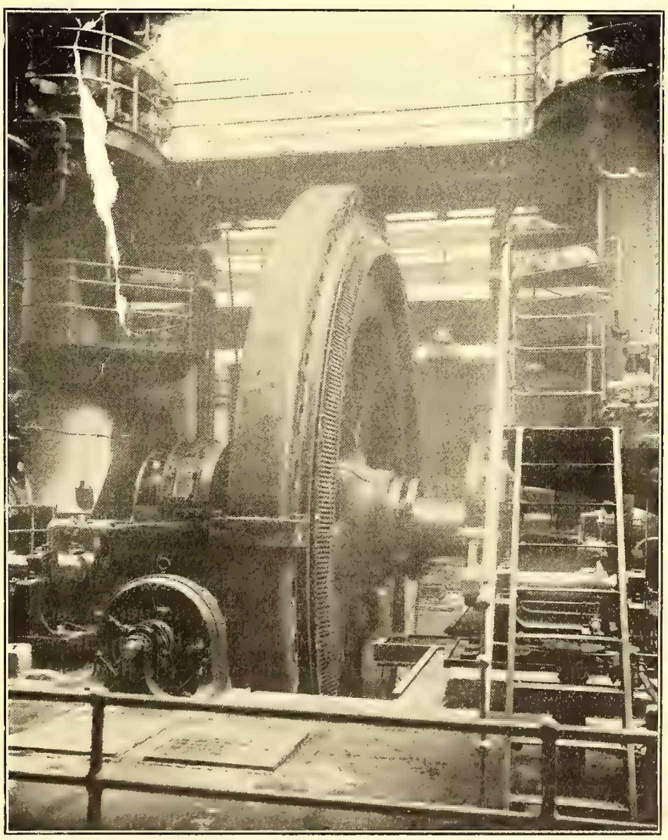
The construction of the superstructure is of a steel framework enclosed externally with brick walls, having Portland stone dressings. The foundation is a concrete raft 6 ft. in thickness, extending over that portion of the site covered by buildings. The roofs consist of steel principals carrying minor steel members which support a covering of coke breeze concrete, the exterior being slated. The interior wall facings are of ivory white-glazed bricks with a brown glazed dado. The floors are of concrete and covered with terazzo paving.

Coal will be brought to the station by ocean steamers, holding up to 2000 tons, which will lie at a specially constructed pier in the Thames. The coal will be unloaded by three electric cranes, with grabs, holding about 2500 lbs. each. The grabs will discharge into trucks on the pier, which, after passing over weighbridges, will discharge into a large steel bunker holding 200 tons. From this bunker the coal will be conveyed by gravity bucket conveyors to the bunkers immediately over the boilers. The object of using an outside bunker of this capacity was to enable a steamer to be unloaded in the shortest possible time without being dependent upon the comparatively slow rate of travel of an ordinary conveyor. The bucket conveyors are two in number, identical with each other, each having a capacity of 40 tons per hour. These have been erected by the New Conveyor Company, of Smethwick. On their return journey the bucket passes through a tunnel under the boiler house, and takes the ashes from hoppers below the boilers, and carries them to a storage hopper under the pier.

The boiler house contains twenty-four water-tube boilers of the five-drum Stirling Company's type, arranged in pairs in two rows, with a firing floor between. Each boiler has an evaporative capacity of about 16,300 lbs. of water per hour, works at 200 lbs. pressure, and is fitted with chain grate stokers. In addition a superheater is placed between the first and second banks of vertical tubes, and forms an integral part of the boiler. The amount of superheat will be sufficient to raise the temperature of the steam to 500 deg. F.

The pairs of boilers are set in groups of three with their economizer block and main flue inlet to the chimney above. These boiler groups are equivalent to one of the engine units, and the present station may, therefore, be said to be divided up into four units of boilers, economizers, flues, engines, etc. Each pair of boilers has its own economizer on the floor above, consisting of 320 tubes, arranged in thirty-two sections. The economizers have been made and erected by E. Green & Sons, Manchester, and the scrapers are driven through worm gearing by small independent three-phase motors. Above the economizers, and at the top part of the boiler house, are situated the coal bunkers. These are built of steel, and have a capacity of 6500 tons total, for the present station, with sub-divisions for each boiler, so that different grades of coal may be stored and to minimize the risk in case of spontaneous combustion.

In the basement of the boiler house are placed on the one side two feed pump rooms, each containing three horizontal ram pumps by John Cochrane, of Glasgow. Each pump is driven by a series-wound Bruce Peebles motor of 35 hp, and the pumps will deliver 8000 gallons of water per hour against a pressure of 225 lbs. The motors are of the direct-current type, and are controlled by means of rheostats in the main circuit. In addition, two voltages, viz., 125 and 550, are provided with a changeover switch, so that the pumps can be run at a low speed. On the other side of the boiler basement



A DIRECT-CONNECTED GENERATING SET

are situated hot well tanks, from which the feed pumps take their supply. These are filled from the condensers, after the water has passed through Harris-Anderson purifiers, which are of the chemical type, and effectively remove all particles of oil from the feed water. Make-up water is obtained from an artesian well, 350 ft. deep x 8½ ins. diameter, in the outside pump house. A water-softening apparatus, also of Harris-Anderson type, is provided in this connection.

The engine-room lies parallel with the boiler house, and contains four steam generating sets of 3500 kw normal capacity each. The engines were made by John Musgrave & Sons, Ltd., of Bolton, and are of the vertical-horizontal type. Each engine consists of two complete half-engines, one on each side of the generator, consisting of a vertical high-pressure cylinder, 33½ ins. in diameter, and a horizontal low-pressure cylinder 66 ins. in diameter. The stroke in each case is 4 ft., and the two connecting rods on the one side of the engine work on to a common overhung crank pin.

The engines run at 94 r. p. m., and work at 180 lbs. steam pressure. Corliss valves are used, both on the high-pressure and low-pressure cylinders, and the exhaust steam from the high-pressure cylinder passes through a receiver on its way to the low-pressure cylinder, and is there reheated by live steam direct from the boilers. All of the engines are entirely enclosed, and work with forced oil lubrication, pumps in duplicate being provided. By the placing of the high-pressure cylinder in the vertical position the drainage becomes perfectly natural, and there are no places in which water can lodge. An independent steam supply is given to each high-pressure cylinder, and each low-pressure cylinder has its own condenser in the basement.

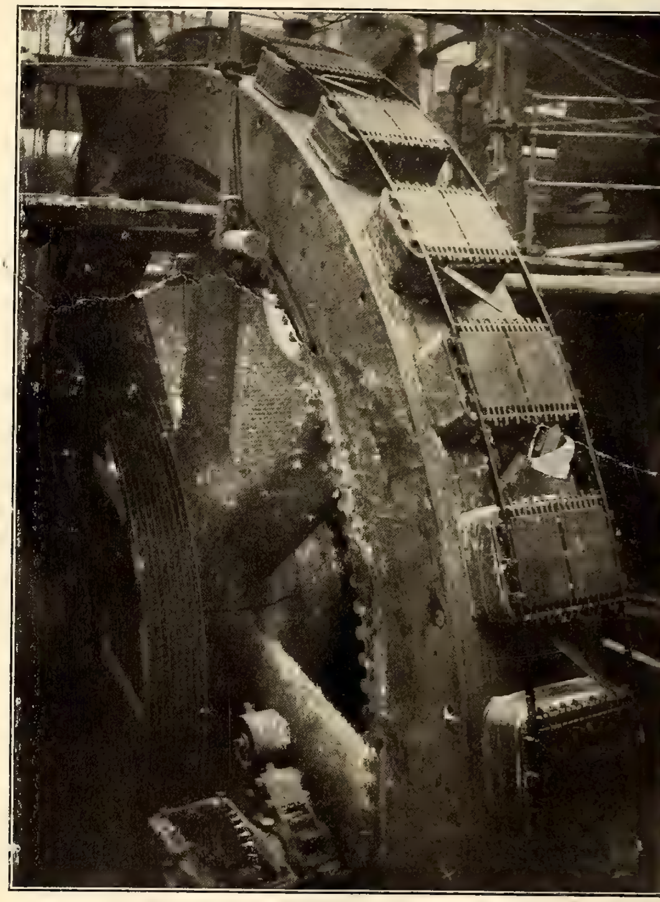
The condensers are of the surface type, with separate motor-driven air-pumps, and the circulating water is obtained from the Thames in a manner afterward described. On its way to the condensers the exhaust steam passes through Barker oil separators, by means of which the greater proportion of the oil is taken out. This has the effect of saving the condenser tubes, but before the condensed water passes to the hot well, it is treated in the purifiers mentioned.

The generators were built by the Electric Construction Company, Ltd., of Wolverhampton, and are mounted directly on the engine shafts, each generator being erected between the two half-engines of each set. They are all of the revolving field type, and deliver three-phase currents at 6600 volts between phases, at 25 complete cycles per second. The normal output is 3500 kw or 306 amps. per phase, and 4375 kw on emergency overload. The stators are star wound, with the center point earthed. The coils are form wound, and are laid in open slots. There are five slots per pole per phase. The magnets are built up of laminated steel stampings, secured in dove-tailed slots on the periphery of the flywheel. The coils are wound one layer deep, of bare copper tape on edge, and are held down by laminated pole tips. The excitation is at 125 volts, and each alternator has its own independent exciter by driven ropes from a pulley on the main shaft. A standby is provided by the steam auxiliary sets mentioned below.

In addition to the four main generators, there are two independent direct-current steam sets, each of 150-kw capacity, which are used for lighting the station, a standby for excitation, and other uses. The engines are by Belliss & Morcom, Ltd., of Birmingham, of 250 hp each, running at 375 r. p. m. The generators are of 150-kw capacity, and were built by Dick, Kerr & Company, Ltd., of Preston.

The steam pipes between the boilers and engines are laid on a most simple system. Each pair of boilers is coupled together as one, and has a single steampipe leading directly to a main steam header in the engine room. From this, header branches go to the engine separators, and there is a continuous fall in the pipes all the way from the boiler stop valves to the engine separator.

The main switchgear is mounted on two galleries in the center of the long side of the engine room, farthest from the boilers. The oil switches are on the top gallery. The switchgear throughout is of the oil-break, remote-control, electrically-operated type, and has been built by the British Westinghouse Electric Manufacturing Company, Ltd. Provision is made for eight generators, and thirty-two feeders, and each generator is coupled directly to a section of four feeders. The various sections are connected by the main bus-bars, but when required the bus-bars can be easily disconnected, leaving the generators entirely on their own feeder sections. The oil switches are mounted on brickwork compartments, and the whole arrangement is entirely fireproof.



GENERATOR BEING INSTALLED

The operating table is on the lower gallery, and contains the small switches which control the main oil switches. The operation is carried out by direct current at 125 volts pressure, and the operator faces the engine room and the instrument panels when at his work. Immediately behind the operating desk is the auxiliary switchboard for controlling the station lighting, station motors, auxiliary machines, and certain low-tension tramway feeders, which supply the tracks in the neighborhood of the station.

The main cables between the generators and the switchgear and the street are carried in chases formed in the east wall. Each cable has its own separate chase, in which it is carried by means of clamps bolted to cast-iron bricks built into the brickwork. The feeders leave the station in two groups by means of two separate tunnels. One tunnel carries the cables for supplying the north of London, via the

Blackwall Tunnel, and the other the cables for the south of London.

Adjoining the switchboard recess is a sub-station, which contains three Dick, Kerr & Company motor generators for supplying direct current to the local tramway lines and for station purposes. Each machine is of 500 kw capacity, runs at 300 r. p. m., and transforms the 6600 volts three-phase current to direct current at 550 volts. A battery of 280 Tudor accumulator cells is provided in the basement, close to the sub-station, for use in conjunction with the sub-station plan.

CONDENSER PUMP HOUSE

For obtaining the condensing water from the Thames River, four 30-in. cast-iron pipes have been laid under the bed of the river at a point below the lowest known tide. These pipes are bell mouthed at their extremity, where they are carried in a concrete basin. Three of these pipes are used either as suction or discharge pipes, and the fourth entirely as a discharge pipe. Elaborate straining facilities have been employed because of the difficulty which has been experienced in previous attempts to use the Thames water for condensing purposes.

YARD

In the yard, close to the outside pump house, a Ransome & Rapier 30-ton electric jib crane has been erected. This has been of great service in handling material for the building of the station.

It is estimated that when completed the station will cost about £900,000.

REPORT OF THE ROYAL COMMISSION ON LONDON TRAFFIC

Volume IV. of the Report of the Royal Commission on London Traffic has just been issued, and brings to a close the publication of what has been undoubtedly the longest and most complicated inquiry into city transportation conditions ever conducted. Though numbered four, the section just published is in fact the last to be issued of the eight large volumes forming the report of the commission. It is an octavo of 1250 pages and 102 plates, and is in many respects the most interesting of all of the sections of the report, certainly from the American standpoint, because it recites the testimony and other data secured by the members of the commission who visited the United States in the fall of 1903. These members were Sir David Barbour, Lord Ribblesdale, Sir John Dickson-Poynder, Bart., M. P.; Sir George Bartley, Sir George Gibb, with Mr. Lyden Macassey, the secretary. Mr. Macassey preceded the other commissioners and spent about five weeks in this country before their arrival, making the preliminary arrangements for facilitating the inquiry.

During their trip the members of the commission visited New York, Boston, Philadelphia and Washington, and secured the evidence of the following witnesses among others: William Barclay Parsons, chief engineer of the Board of Rapid Transit Railway Commissioners; Bion J. Arnold, expert of the Chicago City Council; H. H. Vreeland, president of the New York City Railway Company; E. W. Winter, president of the Brooklyn Rapid Transit Company; Samuel Rea, fourth vice-president of the Pennsylvania Railroad Company; A. R. Piper, second deputy police commissioner of New York City; W. J. Wilgus, fifth vice-president of the New York Central Railroad Company; Gen. William A. Bancroft, president of the Boston Elevated Railway Company; C. S. Sergeant, vice-president of the Boston Elevated Railway Company; Hon. George C. Crocker, chairman of the Boston Transit Commission; Howard A. Carson, chief engineer of the Boston Transit Commission; Hon James F. Jackson, chairman of the Massachusetts Board of Railroad Commissioners; John B. Parsons, president of the Philadelphia Rapid Transit Company, and W. S. Twining, chief engineer of the Philadelphia Rapid Transit Company.

The commission went very thoroughly into the franchise conditions of the roads in the cities investigated, statistics of traffic, street congestion, relative advantages of surface railways, shallow subways and elevated railways, the effect of rapid transit systems on the distribution of population, and policies which are followed in the development of transportation facilities in American municipalities. Information was sought of each gentleman interviewed, not only as to the conditions of the city or cities served by his own system, but with regard to the application of different transit systems to London conditions, and the effect of well-developed urban transportation systems on street traffic and housing conditions. It is, of course, impossible in an article of this kind to digest any considerable portion of the data secured, but attention might be directed to one or two points, to which considerable study was given by the commission. One was in connection with the effect of electric car service upon reducing congestion in crowded streets. There was an interesting and marked unanimity of opinion that a reduction of congestion of this kind follows, partly by giving direction to the other vehicles on the street, and partly by the fact that the cars carry the people in a more compact way than is otherwise possible. Mr. Vreeland's testimony on this point was especially complete, as he reviewed the history of Broadway from the time that the only transportation south of Fourteenth Street was done by omnibuses. At this period there would be times when there would be a mass of vehicles standing still from twenty to thirty minutes at a time, particularly at congested corners like Canal Street and Fulton Street, and many people claimed at that time that it would be impossible to operate a street railway on Broadway with any facility to the public. Some conception of the conditions of that period can now be obtained by observing traffic congestion at certain times of the year on Fifth Avenue, which is the only north and south avenue in the central section of New York City where there is no railway. Captain Piper's testimony corroborated that of Mr. Vreeland, and Mr. Sergeant, of Boston, recited instances of streets in which vehicular congestion in a street had been relieved, through the reasons cited, by the installation of a double line of cars and tracks on the street.

In connection with this point the question arose as to the minimum space which should be allowed between the outside of the rails and the curb. Mr. Vreeland cited Fifty-Ninth Street west of Columbus Avenue, where there is just enough room on each side of the track for an ordinary 5-ft. 2-in. vehicle to be passed by a car, but where a man driving a furniture van would have to put the wheels of the van over the curb if he wanted to stand still on the street to load or for any other purpose. Mr. Arnold, speaking of Chicago conditions, gave it as his opinion that if there was room with two tracks for one vehicle between the car and the curb, the use of a double-track line would decrease congestion rather than increase it. General Bancroft referred to a street in Somerville only 45 ft. in width, in which the company had recently laid street railway tracks. Mr. Winter, of Brooklyn, however, called attention to the fact that the introduction of a line of cars on a street tends to draw travelers from adjacent streets and so increases the liability to accident.

The relative merits and costs of elevated railways and subways were also very carefully considered. Mr. Twining estimated the construction of the Philadelphia four-track subway at about $500 per running foot, and the elevated railway in

Philadelphia, exclusive of foundations and rails but including stations, at about $40 per running foot. Gen. Bancroft referred to the difficulties of subway construction in the streets of Boston on account of their crooked character which prevented securing high speed, whereas the elevated railway is outside of the congested district and straighter. The initial difficulty of noise with the elevated road has been largely reduced and the public is now asking for extensions. Others, among them Mr. Arnold and Mr. Carson, called attention to the greater desirability from the standpoint of the passenger of the elevated railway, but Mr. Arnold concluded that under American conditions it often would be more expensive than a subway on account of payments for damages to abutting property.

The testimonies of Mr. Wilgus and Mr. Rea were devoted principally to the plans of the New York Central and Pennsylvania Railroads in entering New York City. The testimony of both, however, give facts and opinions outside of the technical descriptions of the plans of their companies, which were of great interest. Thus Mr. Wilgus outlined his ideal of suburban transportation when possible. This is for local cars operating throughout suburban towns and villages to take up passengers along the route, and then join the express line where, consolidated into trains of the desired number of cars, they would pass at high speed to urban points of distribution. Here, if desired, they can be again disintegrated into separate units so as to pass to different parts of the city over the local means of rapid transit. This is possible with the multiple-unit system. Mr. Rea differed somewhat from Mr. Wilgus, and did not think that the trunk lines in the neighborhood of large cities certainly could handle strictly local traffic to advantage. He said that he expected that the Pennsylvania tunnel in New York would soon be filled to its normal capacity with through trains. He also said that he did not believe that there should be stations within four or five miles of the terminal, as that traffic could very well be left to local transit systems. The Pennsylvania Company's average rate for commuting riders out of Philadelphia is 0.7 cent per mile, so that for five miles the company only gets 3½ cents, whereas the average cost of putting passengers through the Broad Street Station is figured by the company at 3 cents, leaving only 0.5 cent to pay for the transportation. He said that when electric railway operation started around Philadelphia the company's Philadelphia-Washington line began to lose suburban travel heavily, but this has now come back, because the trolleys induced dense building within the first few miles, while in the outer sections people had to use steam railroads.

The testimony of the experts mentioned is followed in the report by fourteen appendices. Appendix A includes statistics of passenger traffic and car service of the New York City Railway, contributed by Mr. Vreeland; of the Manhattan and Interborough Rapid Transit Companies, contributed by Mr. Bryan; of Brooklyn, contributed by Mr. Winter; of Philadelphia, contributed by Mr. Twining; statements relating to the Pennsylvania extension to New York and the traffic of the New York Central, contributed respectively by Messrs. Rea and Wilgus; memoranda on the transit conditions and the subway in New York, by Messrs. Parsons and Macassey, secretary of the commission; sections of the New York State constitution, New York City charter, New York State Railroad law relating to street and steam railroads, police regulations on traffic; memoranda on transit conditions in Boston, by Messrs. Crocker and Macassey; Massachusetts Street Railway law; article on transportation conditions in New York by Hon. Robert P. Porter, and extracts from the Census Reports. While a large part of this information has, of course, been published previously in other places, including the report of the Merchants' Association and the Railroad Commissioners' reports, some of it is new, such as the passenger traffic of the New York Subway by months up to December, 1905, showing the passengers carried from each station of the subway. This table shows that the following are the stations with an average of more than 100,000 passengers per month during the year ending Oct. 31, 1905. They are arranged in their order of patronage:

Brooklyn Bridge, 1,309,806.33; Grand Central Station, 611,-425.17; Fulton Street, 475,801.33; Times Square, 411,265; Twenty-Third Street, 353,201.08; 116th Street and Lenox Avenue, 343,704; 125th Street and Lenox Avenue, 303,478; Astor Place, 262,319.25; 135th Street and Lenox Avenue, 249,688; 110th Street and Lenox Avenue, 244,272.63; Wall Street, 239,857.25; Columbus Circle, 214,865.25; Ninety-Sixth Street, 206,095; Eighteenth Street, 190,603.66; Seventy-Second Street, 188,051.83; Bleecker Street, 181,470.08; 103d Street, 177,209.75; Thirty-Third Street, 168,820.25; Spring Street, 168,718.66; Twenty-eighth Street, 167,733.08; Fiftieth Street, 161,993.08; Third Avenue, 149,380; Canal Street, 146,-739.75; Eighty-Sixth Street, 138,905.08; South Ferry, 135,-366.66; Sixty-Sixth Street, 131,870.17; 145th Street, 131,163; Seventy-Ninth Street, 121,542.91; Jackson Avenue, 114,235; Prospect Avenue, 111,887.81; Manhattan Street, 100,308.41; 157th Street (opening Oct. 28), 100,008.33.

Appendix B gives notes of the visit to the United States contributed by Sir John Dickson-Poynder, member of the commission. He calls attention to the tremendous distribution of urban population secured through the highly-developed street railway systems of this country, and to the effect on land values and rents. He also refers to the increase in the amenities of life due to the street railway systems. It not only encourages people to live in independent houses, but tends to widen social acquaintance and affords opportunity for those to attend places of entertainment and instruction of the best kind in the central parts of the city. In London, owing to the absence of such facilities, the report states that the suburban inhabitant is in the town but not of it, and is practically debarred from many of the advantages of town life in the enjoyment of the higher class entertainments offered by the West End. The report also calls attention to the increase in usefulness through access of the street railway to public parks, ball grounds and amusement resorts, and to the development of resorts owned by railway companies.

Appendix C gives a memorandum on the rating of railways by Sir John Dickson-Poynder, and Appendix D notes on the visit to the United States by Sir George C. T. Bartley. Sir George's conclusions were as follows:

The experience of the United States seems to show that in that country the following conclusions may be drawn:

1. The establishment of some authority of considerable power subject only to the control of State Commissioners or the State itself seems to be regarded now as essential.

2. The extension of trams in the most densely peopled parts where the streets are sufficiently wide, and the building of subways in relief of the streets is regarded as an efficient and even necessary means of meeting locomotive needs.

3. The rapid handling of masses of travelers to busy parts, in the morning and evening, taking them without change as near as may be to their work, is only to be secured by a system of practically continuous cars in every required direction. These cars to be either on the surface or in subways or both.

4. The co-operation of the main lines of railways in the distribution of traffic, and the use of some part or some floor of their large stations for this purpose.

5. The financial assistance of municipalities to private companies, safeguarding the former by conditions and periodical revisions of license.

6. The establishment of a universal small fare per journey, with but one class of carriage.

7. The granting of greater power to the police for regulating traffic and the selection of streets and routes of traffic of different kinds.

8. The fact that increased facilities, even in the same streets, so far from injuring the existing traffic, improves and increases the business of all traveling agencies.

9. That surface tram lines alone do not meet the difficulty of congestion in those streets, especially the narrow ones having a large amount of ordinary traffic.

10. That subways seem to be an essential part of any system, especially in the centers of large towns, and that with proper care they can be built with but little surface disturbance.

11. The subject of the widening of streets seems to be little considered in the United States, owing to the fact that the cities are usually built in blocks, with parallel streets.

12. Great care seems to be taken in America in obtaining the consent of a majority of the inhabitants of a street to any tram line or other change, though power is usually given to override the veto of the street, and even of the Mayor, in extreme cases.

AMERICAN RESULTS: HOW APPLICABLE TO LONDON

While fully appreciating the differences that exist between London and New York and other cities of the United States, it would seem that in many ways lessons useful to London may be learned from the cities visited.

(a) Though the authority and its power and mode of creation would have to be very different in London from New York or other American cities, it is clear that no complete practical scheme can be adopted or active steps taken to cope with the question of London traffic efficiently, as a whole, until some authority with great powers is brought into existence subject only to the superior authority of Parliament.

(b) Though not in a position to enter into detail as to what additions to the facilities for traffic are likely to be needed at once in London, it is clear from the places we have seen that a large increase in surface trams, subways, facilities at the existing stations, and in the center of the city are possible and must be freely adopted to bring London even up to the standard of New York.

(c) The authority above suggested would, as in New York, consider all matters of locomotion and gradually adopt them as part of one great scheme, to be developed and extended from time to time as occasion required. All extensions to be of course subject to Parliament sanction and control.

(d) From the nature of London streets, and the absence of all rectangular blocks and in many places of practical alternative routes, it is clear the question of new streets must enter more into the London problem than has been necessary in New York.

(e) As regards the cost, it would seem that much might be learned from New York. Here the great subway, costing nearly eight millions sterling, will really not add a penny to the burdens of the city. In America there is a strict limit to municipal indebtedness, which we have not in England, and these great works are carried on by a system of co-operation between private enterprise and the municipality which seems to be well worthy of imitation.

The remainder of the appendices of Vol. IV. are devoted almost entirely to statistical tables of London, report on tramway systems in the United Kingdom, laws relating to tramway concessions in France, notes on foreign tramways and indices. The summary of facts and conclusions of the entire committee is as follows:

SUMMARY OF FACTS AND CONCLUSIONS

1. In the cities we visited, omnibuses have almost disappeared, and cabs are only used to a very limited extent.

2. For the ordinary means of locomotion, reliance is placed on surface tramways, elevated railways, and underground railways passing along "shallow" subways; all these are worked, or are to be worked by electricity. The crowded streets of New York are practically as crowded and congested as similar streets in London, but the bulk of people are able to get along them with fair speed and comfort in the tramcars. The evil of crossing traffic is felt in New York as well as in London, and no means of overcoming the evil has been attempted, or, so far as we could learn, practically suggested. The obstructions caused in crowded streets by vehicles standing at the curbs are also as great, and equally beyond the power of the police authorities to cope with. The suburban rush at the usual morning and evening hours is as great in New York as in London, and the problem of dealing with it is equally pressing. Indeed, we have nothing in London so bad as the rush at Brooklyn Bridge to enter the tramcars.

3. Authority for the laying down of street tramways is now generally given by the municipal authorities, application to the legislature for sanction not being necessary. There is a marked tendency in the case of tramways towards amalgamation for operating purposes, and even towards the inclusion within such arrangements of both elevated railways and underground railways. In Boston, as in other towns of Massachusetts, the concessions for tramways used to be revocable at the discretion of the local boards. The sanction of the State Railroad Commissioners has now been made necessary to the validity of a revocation. On this and other questions connected with tramways, the report of a special committee on "'The Relations Between Cities and Towns and Street Railway Companies," appointed by the State Legislature of Massachusetts, and presided over by Hon. Charles Francis Adams, contains valuable information.

4. The elevated railways possess certain advantages as a means of locomotion, but without going so far as to say that in no place and under no circumstances should an elevated railway be built, they are clearly not suited for London streets.

5. The "shallow" underground railway is preferred to the deep-level, and the latter style of railway will not be accepted unless when the former is out of the question. The reasons for preferring the "shallow" underground railway will be found in the first report of the Boston Transit Commission (Aug. 15, 1895), referred to in the memorandum on Boston. The "shallow" underground railway is likely to be largely used in the future, as the increase in traveling is such that the surface tramways alone, in many places, will be unable to carry the traffic without producing intolerable congestion. The "shallow" underground railway will be specially useful in forming a connection between different portions of the tramway system when the intervening streets do not admit of a satisfactory tramway service along them. The protection of the street traffic, and of the business of frontagers while such railways are being constructed, appears to be chiefly one of expense, but this is a question on which, in connection with London, the best engineering and expert opinion should be taken.

6. Valuable opinions have been obtained on the expediency of laying surface tramways in streets crowded with traffic. It seems obvious, however, that each case will have to be considered on its merits: the character of the street (whether residential or business, and the kind of business), the amount of traffic, its nature, the extent to which the passengers carried by other vehicles will be absorbed by the tramcars, and the possibility of heavy traffic finding an alternative route, being all important factors.

7. The tendency towards the amalgamation for operating purposes of urban tramways and railways, and the practical impossibility of rival tramways or railways being constructed when once the field has been occupied by such a combination, confirm the belief that competition through private ownership cannot be relied upon in such cases for the protection of the interests of the public. The owners of the amalgamated tramways and railways acquire a monopoly within the area which they serve, and it becomes essential that their tenure and management of their lines should be subject to equitable regulations.

8. Neither in New York, Boston or Philadelphia were any surface tramways found to be owned by the municipality. In both New York and Boston underground electric railways were being constructed at the cost of the city, but the construction was carried out under the control of a body of commissioners, and the lines when constructed, though owned by the municipalities, were to be operated by lessees.

9. In New York State there exists a body of State Railroad Commissioners, with wide powers of supervision over railroads, and also with power to recommend drastic measures, these measures being enforced by mandamus of the Supreme Court if they are "just and reasonable."

In Massachusetts there exists a similar body, which also possesses wide powers of making recommendations, these recommendations being dealt with by the legislature and not by the courts of law. The recommendations of the Massachusetts Railroad Commissioners are generally accepted and acted upon by the company concerned. Extracts from the acts constituting the New York State Railroad Commissioners and Massachusetts State Railroad Commissioners are appended, which show the nature of the powers they possess. In both cases the Commissioners were said to command general confidence, while their working was beneficial to the public interests, and satisfactory to those immediately concerned. These facts show the valuable influence that can be exercised by a body of competent and independent persons who are authorized to act as arbitrators on the many and unforeseen causes of dispute that must arise between

the public and the companies possessing, to a greater or less extent, a monopoly of the means of communication.

10. In dealing with the question of the housing of the working classes reliance is placed on the provision of quick transport, the cost being within the means of those affected and the building of suitable dwellings is left to private enterprise.

SOME GUIDING PRINCIPLES IN THE ADJUSTMENT OF THE RELATIONS BETWEEN EMPLOYER AND EMPLOYEE *

BY H. H. VREELAND

In no respect has the great advance of modern industry been more disorganizing—if I may, for want of a better, use that word—than in the relationship between employer and employee.

In the earlier stages of industrial life, when great artisans gathered about them journeymen and apprentices, the numbers were so limited and the conditions of life so restricted that there was established, of necessity, a relationship almost of guardian and ward. Master and man not infrequently lived together, had identical tastes, shared the same social, artistic and commercial ambitions, and were inspired with a common civic pride, vivified by the comparatively amiable rivalry involving other cities and towns whose people were engaged in work of the same class. This patriarchal relationship, of course, has its limitations and would be quite impractical in the vast hives of industry made necessary by modern conditions. To linger in regret over its departure would, to practical minds, be a waste of sentiment much like bewailing those good old stage-coach and canal-boat days now happily forever gone.

I have no sentimental protest to make about the altered conditions which now make it possible for twenty men, in a day, with the aid of machinery, to do as much as one thousand could have formerly done with their hands in six months; but in the change there has come about an alteration in the relationship of employer and employee that I, in common with every right-minded citizen, must recognize as not for the best interests of the State at large, and assuredly not for the best interests of those immediately involved and affected by it. One of the most conspicuous results of the sudden and still active expansion of the personnel of great industries has been the annihilation of individuals; the utter submergence of single human units. This inundation in some places is so great as to be utterly destructive of all possible individual development. In some of the industries the numbers are so great that the ultimate managers, for mere clerical convenience, are compelled to consider their employees in classes, some of these classes or units comprising as many as 10,000 men; and so, as business grows, the distance between employers and employed seems daily to widen.

This separation has, as was inevitable, given rise to a lack of sympathy between the two extremes of all great industrial concerns that needs the attention of thoughtful men. It has, in the past twenty-five years, expressed itself in many wasteful efforts at readjustment. Workingmen do not understand the besetments of the employers, and it is equally true that amid the anxieties of competition and preoccupations which far-reaching enterprises entail on them, the employers are not fully awake to the conditions of those they employ.

As I see the situation (and I have been familiar with it for a great many years) there seems to be very little possibility of bringing about the re-establishment of anything approximating even the condition I spoke of in opening this talk. This conviction long ago turned my attention to a close study of the situation in order to ascertain if some substitute for the old lost relationship might not be found.

In searching for the small human beginnings of a number of classical industrial disagreements, I was surprised to find that it was not so much a lack of sympathy between the capitalists or executive directors of these great concerns and their men that caused the trouble, as an utter lack of sympathy or executive ability among petty subordinates; men clothed with brief authority, who failed to exercise it beneficently and intelligently. In my search I took in the history of several great enterprises that seemed to have escaped the troubles that beset others, and there I found further corroboration of the truth that intelligence and humanity were potential and that the reason these concerns had not had trouble was because of the intelligence, sympathy and firmness of the subordinate heads in charge of the various groups and classes of men. From my own experience, with a very miscellaneous lot of men numbering about 15,000 in the city of New York, men gathered from all quarters of the country and of all nationalities, I have had abundant proof that firmness tempered with the intelligent sympathy for their necessities works wonders.

And so, if I had to speak a word of advice concerning the most important principle in the proper adjustment of the relations between employer and employee, it would be, "have a care in the selection of your subordinate heads." Only a man who knows the conditions and point of view of those he commands has the capacity to control or influence workingmen for their own good. If he has knowledge and experience that is common to them, if he knows the kind of lives they lead, the anxieties that pursue them, the ambitions they have for themselves and their families, he is surely the man indicated for advancement and control, it being always understood that he has executive capacity. To take a man who has executive capacity and has administered it in one field, or among a certain class, and place him in charge of a group of men with whom he is not in the kind of sympathy I have stated, and expect him to control them intelligently, is out of the question, in my opinion. Such a man may take his orders from his superior and execute them with military decision, and yet fail to get what would be naturally expected out of his men. Nor will such a man keep his subordinates contented, and this element to my mind is of quite as much importance as a wage scale.

There has grown up also, my investigation shows me, a custom that from the human point of view is very cruel, but which from the economic point of view is absolutely essential. It is the custom of estimating the potential of men in mass as you would an engine, and by hard and fast rules expressing from the mass a given number of units of product. When this custom is put into operation and there is lacking the sympathy and knowledge of conditions that I have spoken of, the result is at once brutalizing and disappointing. It is bound to break down of its own rigidity, and in my experience in the long run it is not economical. On the contrary, I think experience shows it to be wasteful. In the great aggregation of men and capital which go to make up our modern industrial units, it may have been inevitable that in concerns suddenly brought into life, new and strange foremen or department heads were necessary, and I suppose that much that is justly complained of by working men and those who investigate their status will gradually disappear, as there is enlightened recognition of the profitableness of blending into the relationship of employer and employees the intelligent understanding I have spoken of, and which to my mind is essential to the peaceful and profitable prosecution of any kind of work in which great masses of men are engaged.

*Paper presented at the Philadelphia Convention of the American Academy of Political and Social Science.

THE STONE & WEBSTER ORGANIZATION, AND THE PROPERTIES IT MANAGES

So far as the electric traction and lighting industries are concerned, the firm of Stone & Webster, of Boston, was one of the pioneers in that important movement, now becoming more and more widespread, whereby the indisputable advantages of centralized management and administration have been applied to independent and widely scattered properties. As early as 1890 this firm formulated certain definite policies looking to the acquisition of financial and executive interests in a special class of public utility companies. These policies, it may be said, have been consistently and steadfastly followed with the result that the firm is now interested in some twenty-eight electric railway, gas and electric lighting, and power properties located in widely separated sections of the country and for which it acts as financial advisor and executive head. The following is an attempt to outline some of these policies; to indicate certain unique features of the organization, and to show how, by reason of a centralized executive office, the firm has been able not only to administer the properties with greater economy but primarily is able to give the communities interested the benefits of better service and improved facilities that could never be assured by a small local corporation working entirely alone.

The firm buys properties with the idea of operating and holding, as distinguished from promoting with the view of selling. It has taken over public service corporations in certain growing communities with the purpose of reaping whatever benefits may accrue from intelligent and broad-minded development and operation. In its relation to the companies under its management the practice of the firm is unique, inasmuch as Stone & Webster's financial interests lie largely in the stocks of the various companies. It is the endeavor of the firm to develop the properties and maintain them at the highest efficiency, thereby insuring increased earnings and enhancing the integrity of the bond issues. The firm has for the most part confined its interests to public utility properties of what may be termed the "middle size." These are the properties whose individual earning capacity does not warrant the engagement of trained specialists for handling departmental work, but whose manager must combine in himself many of the functions that in a larger property are distributed among several specializing heads of departments. Stone & Webster meet the limitations of the smaller enterprise by putting in charge as local manager a competent all-round operating man, and then placing at his command for advice and help the corps of highly trained experts in the Boston office.

The organization of Stone & Webster, so far as the management of companies is concerned, is built around an executive committee, which consists of six men, each one of whom is a specialist along certain lines of practical work. The members of this committee come within the scope of the popular definition of "all-round men," but, in addition, each has special aptitude and qualifications for solving a particular class of problems. For instance, one member is an expert in street railway management, another is a specialist in the administration of electric lighting utilities, another in waterpower development, and so on. The apportionment of responsibility among the individual members of the committee is not entirely along the lines of specialized work, but is also geographical; that is to say, each member of the committee is responsible for the general supervision of certain of the properties or groups of properties, and it is his particular province to follow the condition of the companies assigned to his care. In this he may at all times avail himself of the advice of any other member of the committee, or of the committee as a whole. In the direction of fostering the spirit of coöperation and mutual helpfulness, it is the practice to have each member of the executive committee visit at intervals the properties for which he is responsible, and to the same end all the local managers make a visit to the Boston office at least once a year.

In conjunction with the executive committee the central office is divided into departments, each with an expert at its head, and each one of which looks after one particular class of work. It will be understood, however, that the departmental divisions are not absolute, but to preserve the continuity of the organization as a whole there is a certain overlapping and interdependence between all the divisions of the staff. The departments may be enumerated as follows:

Engineering.
Purchasing.
Auditing.
Corporation.
Statistical.
Securities.
Library and document filing.
Miscellaneous office departments, as mailing and letter filing, stenographic service, office force, etc.

Before explaining in detail the work of the individual departments, it is in order to refer back to the original starting point, and examine more at length into the fundamental principles underlying the whole structure of the Stone & Webster organization. It should be kept in mind that the companies controlled are distinct corporations, each standing on its own merits, with its own officers and board of directors, and its own bank accounts used only for its own purposes. This complete independence is a necessity, because, with the exception of Stone & Webster, the holders of the securities are not common to the different companies.

The central office has endeavored to add to the benefits of this independence the indisputable advantages of a large executive organization. These advantages may be summarized in the possibilities that come from a broader view and the bringing to bear of a more consistent management than can be assured with any small or middle-size isolated property under the control of one manager. They include the providing of trained men for the study and handling of special problems, especially along the following lines:

Good engineering.
Benefits of purchasing in large quantities.
Proper and uniform accounting.
Economical financiering.
The keeping of proper and systematic records of the acts of the corporations.
The compilation and study of statistics of operation.
The advantageous marketing of securities.
The gathering and dissemination of information.

In conjunction with all these advantages, and because of them, are the undeniable advantages to the local communities that accrue through broad and consistent management and the rendering available of the financial backing necessary for making the essential improvements, betterments and extensions.

While the administration of the various properties primarily centers in the Boston office, there is no intention of hampering or curtailing individual endeavor on the part of the local managers.

In empirical discussions on this subject of centralizing the handling of public utilities, fears have sometimes been expressed that the concentration of managerial authority into a distant "home" office will have the effect of gradually destroying the usefulness of the local manager, by limiting him as to initiative thought and action, and by breaking down his

power to think and act for himself. The prevailing spirit in the organization under consideration is directly contrary to this tendency. The aim in this regard is to build up and not destroy individual suggestion and endeavor, so long as the ideas advanced are tenable and logical. As a matter of fact, it is recognized that the value of the local man depends solely on his ability to originate and execute. The Boston office stands in the relation to the local manager not so much as censor as a storeroom upon which he can draw for suggestion and advice. Necessarily, inasmuch as Stone & Webster are heavily interested financially in the properties they manage, they require that the properties be operated along certain lines of their own definition, just as any well-handled enterprise should be subject to restrictions imposed by the owners. The local manager is at his post to look after the local well-being of the company in his charge, to take care of the thousand and one details; to develop the business and activities of the company; to develop and keep in mind the interests of the community served; to plan and suggest and improve; to execute; and to keep the home office fully informed as to the conditions and details of the property committed to his care. Machine-managed properties are not desired, nor are the local managers in any sense regarded or treated as machines. The supervision of the home office is directed solely to the securing of uniformity in standards and practice; the elimination of opinionated and illogical management, and the supply of competent and expert advice in the formulation and execution of policies.

Matters that are distinctly local are left with the individual companies. These include such questions as claims, which are settled by the management on the ground, of course, in consultation when necessary with the Boston office; mechanical maintenance of cars and equipment; formulation of schedules, and similar details. On these points the local managers are judged solely by the results achieved.

Again, in line with consistent management, a standard set of rules for trainmen has been codified and is in use by all the companies. The body of the rule book is the same for all companies, but to the standard code are appended such few additional rules and regulations as are necessary to serve the local requirements.

Touching upon the treatment of employees, the Boston office encourages the formation of local benefit associations, social and recreation organizations, such as bowling clubs and baseball teams, the furnishing of rooms for the men, and any other local endeavor in the direction of securing conveniences for employees, and bettering the conditions under which they work.

Supplementing the local effort in this direction, the Boston office maintains a Savings Association. This association was founded in January, 1901, for the purpose of encouraging the spirit of saving among those in its employ. The firm contributed a large reserve or trust fund, to which are added deposits of individual employees. Any person employed by the firm or by any of the companies controlled, in whatever capacity, may deposit money in small or large amounts, and money so deposited begins immediately to bear interest and continues to do so until withdrawn. The money is invested in securities of known value, and the interest so accruing is distributed to the depositors. The trust fund and its management are in the hands of trustees chosen from among the depositors.

MAP SHOWING LOCATION OF ELECTRIC RAILWAY AND LIGHTING PROPERTIES MANAGED BY STONE & WEBSTER

ENGINEERING

This department deals with the broad schemes of development, such as the remodeling of a power house or the laying out of a distributing system, that would ordinarily call for the services of a consulting engineer and a large engineering force. The department passes on the general problems involved, prepares the plans and then either turns over the execution to the local management or carries out the work under the supervision of its own representatives. Minor engineering questions of station development, track work, etc., are, as a rule, left to the local management.

The firm is gradually working toward uniformity of en-

gineering standards, although no attempt has been made to arbitrarily apply rigid standards to all of the properties. Accumulative data and results of experience are being kept, and it is not improbable that classifications will be made of various general conditions and practice will gradually crystallize into certain uniform standards in track, rolling stock and power generation wherever similar conditions of service prevail.

PURCHASES

The ordinary run of everyday supplies are bought by the local managers, and in this connection local dealers are patronized in so far as possible. The larger orders, as, for instance, for rails or for cars, and orders for supplies that are used by several of the companies in large quantities are placed through the Boston office. The advantages of a centralized purchasing bureau to the individual companies are manifest. This bureau is able to keep in close touch with changes in the market, and by buying in quantities is in a position to obtain better prices and more favorable deliveries. The importance of buying with the market is especially evident with regard to such items as copper, lamps, carbons, etc. In case of especially low markets in any of the commodities upon which the price fluctuates, the Boston purchasing agent ascertains the approximate needs of the local companies with respect thereto and buys accordingly. Frequently contracts are let as blanket orders, that is to say, an order is placed for a million lamps, and the local manager is informed what portion of this order has been alloted to him and he draws on the manufacturing company direct for his allotment.

In the operation of the purchasing department there is, again, no thought of hampering or curtailing the local manager. The manager makes his requests and requisitions for supplies upon the head office, about as he would upon his board of directors, except that the Boston organization goes further and helps him save money for his company by buying through a central purchasing bureau.

AUDITING

In 1901 Stone & Webster devised and adopted a standard system of accounting for all of the companies which they manage. The classification is very similar to the standard form adopted by the Street Railway Accountants' Association of America, and the National Electric Light Association.

The individual companies make detailed monthly reports to the auditing department in Boston, where the auditing is done in conjunction with traveling auditors, who visit all of the properties at intervals. It is the duty of the auditing department to handle the general finances of the individual corporations; to see that funds are provided for any proper work; to see that dividends, interest on bonds, and other charges are properly met, and in general to supervise the finances and accounting of the properties.

It should be stated that there is no merging of accounts as between the individual companies controlled. The funds of each company are deposited in a separate bank under the individual company's name, and, in this respect, each property stands absolutely on its own basis. This principle is carried into all matters of finances, and if one company requires new revenue from capital or bonds the money is raised on the individual credit of the individual company. Naturally some companies can secure funds at a lower rate of interest than others, but in this respect there is no intermingling or lending of the credit of one company to the advantage of another. The only thing that is done in this regard is that in each case Stone & Webster lend their prestige and reputation to the local companies in their efforts to secure proper and necessary capital. Thus, without losing its individual standing, each company secures the advantage accruing from centralized interests.

In the classification of construction accounts the idea has been to secure a simple, understandable and logical grouping of costs. All expenditures on construction account are divided into thirteen accounts, which give the information required by the home office and show as a summary of construction costs. These are divided into sub-accounts and these sub-accounts are again divided into a third series, covering expenditures in greater detail.

CORPORATION

Each company has one or more attorneys to advise on all legal questions, and it is the duty of the corporation department to keep in close touch with all such matters pertaining to the companies, and to see that they receive the necessary attention from the attorneys.

In conjunction with the attorneys, the department sees that all the requirements of the laws under which the companies are incorporated are complied with, that the provisions of the mortgages, trust deeds, by-laws, etc., are carried out, and that all necessary formalities are complied with in the issuing of new securities.

The department is responsible for the keeping of proper and systematic records of the acts of the corporations, arranges for the holding of stockholders' and directors' meetings, and sees that the minutes of such meetings are properly kept. It also sees that all contracts, agreements, mortgages, trust deeds and other legal papers are properly printed, recorded and filed.

The department prepares each month what is called a "Calendar," which contains detailed information in regard to corporate matters, which must be attended to during the month, such as, payment of coupon interest, sinking funds, dividends, renewal of contracts, etc.

COMPILATION AND STUDY OF STATISTICS

The statistical department of Stone & Webster is one of the unique, and at the same time one of the most important, features of the organization. This department receives each month two reports from all of the companies. One of the reports covers the financial results, and is practically a duplicate of the financial report prepared for the auditing department, as previously mentioned. The second report covers operating statistics of the physical property, and includes such items as number of cars, number of employees, details of service, accidents, transportation data, car miles run, and power station data. Accompanying these monthly reports the local manager presents, in the form of a letter, a review of the condition of the property during the month. In this he discusses changes in the municipal conditions or relations; competitive franchises applied for or suggested; changes and general information in regard to labor situations; general information in regard to the condition of the business, specifying any special causes which have affected the company's earnings and their probable bearing upon the future; changes in rates for light and power (lighting companies); changes in fares and fare limits (railway companies); explanation of accounts that show extraordinary increases or decreases. In other words, this monthly review of each property by its local manager is intended to enable the home office to understand the variations and conditions in each property without further correspondence.

When these reports are received by the statistical department, they are checked over and all computations verified. The department then begins a comprehensive study and analysis of each statement. Such ratios as have been found to be the best indices of the company's condition and opera-

tion are figured out and are used in comparing the results of each company with its own previous operation, and each company with all the other companies. From the results of these computations, curves and tables are prepared on individual items, studies are made indicating the trend of development, estimates of future requirements are prepared and, incidentally, letters of advice and suggestion are sent out.

The statistical department keeps records and descriptions of all real estate and other property owned by the different companies, including photographs of every type of car, and maps showing location of tracks, distributing systems, paving, rail sections, land owned, etc. It handles insurance matters, seeing that the proper amount of insurance is carried on all buildings and property, and checks the renewals of policies and the payment of premiums. It keeps records of the forms and blanks used by each company, properly codified and indexed, and supervises the preparation of new blanks by the local companies to make sure that these forms will give the information desired.

The department makes special compilations, computations and reports of any special subject or investigation required for the solving of a particular local problem. It obtains from the local managers estimates of the anticipated earnings and expenses of each company for the coming year, each item being shown separately. This work has been peculiarly successful, and the estimates made for the current year are being verified very closely by the actual results obtained. This practice of requiring detailed estimates is proving of great value to every one responsible for the operation of the properties, as it trains the men to look ahead and study conditions, and enables a much more intelligent laying-out of plans for financing improvements, extensions, etc.

New propositions offered to the firm for consideration pass through the statistical department, where the data submitted is checked, and any additional information added which will assist in determining the merits of the enterprise.

The department is responsible, in general, for the training of new men to administer the affairs of the firm and of the individual companies. Young men are taken into the department and given every facility and assistance to become familiar with the methods of the organization and to acquire knowledge of the companies. The aim is to render available trained men, rather than specialized men.

SECURITIES

The securities department handles all details with reference to the marketing of the securities issued by the various companies, and is the channel through which information concerning the financial condition of each company and its securities is given out.

It prepares numerous circulars describing the properties and their securities, prints monthly statements for each company, showing the earnings, and comparing them with previous figures, and at the close of each calendar year prepares a booklet, giving a description of each property and the information concerning it which is desired by the average investor. These publications are distributed to all stockholders and others who are interested.

The department also endeavors to bring together the companies or holders of securities who may wish to sell, and bankers or others who may wish to buy, and keeps a careful record of quotations on all securities, together with bids and offerings.

EARNINGS AND EXPENSES FOR TWELVE MONTHS ENDING DECEMBER 31, 1905, OF COMPANIES MANAGED BY STONE & WEBSTER

	Character of Service.	Miles of Electric Railway Track.	Gross Earnings.	Operating Expenses.	Net Earnings.	Interest Charges.	Balance.	Dividends.
Blue Hill St. Ry. Co., Canton, Mass.	R.	19.56	$84,125.64	$70,080.38	$14,045.26	$19.691.04	*$5,645.78	......
Brockton & Plymouth St.Ry.Co.,Ply'th,Mass	R.	24.06	102,143.48	70,665.04	31,478.44	21,291.17	10,187.27	......
Cape Breton Elec. Co. Ltd., Sydney, N. S.	R. & L.	30.86	211,980.53	155,262.24	56,718.29	44,295.45	12,422.84	......
Columbus Electric Co., Columbus, Ga.	R.L.G.& W.	24.32	....	....	......	......	......	....
Net earnings applicable	......	....	....	....	68,603.05	30,753.25	37,849.80	....
Columbus R. R. Co., Columbus, Ga	......	See C.E.CO.	173,699.90	110,322.05	63,377.85	22,779.91	40,597.94	......
Dallas Electric Corp., Dallas, Tex	R. & L.	53.71	934,706.75	572,228.26	362,478.49	182,667.62	179,810.87	$40,500.00
Edison Elec. Ill. Co. of Brockton, Mass.	L.	....	145,979.44	103,368.91	42,610.53	8,452.24	34,158.29	12,500.00
El Paso Electric Co., El Paso, Tex.	R. & L.	18.72	288,943.16	190,560.68	98,382.48	43,326.77	55,055.71	12,000.00
Fall River Gas Works Co., Fall River, Mass.	G.	....	352,958.53	219,233.45	133,725.08	4,906.68	128,818.40	63,500.00
Galveston Electric Co., Galveston, Tex	R. & L.	32.59	†194,597.57	117,382.36	77,215.21	33,333.34	43,881.87	10,500.00
Houghton Co. Elec. Lt. Co., Hancock, Mich.	L.	....	211,723.41	101,190.30	110,533.11	26,250.00	84,283.11	38,000.00
Houghton Co. St. Ry. Co., Houghton, Mich.	R.	26.23	‡111,106.84	71,952.13	39,154.71	22,464.48	16,690.23	6,000.00
Houston Electric Co., Houston, Tex.	R.	43.90	517,315.15	313,524.51	203,790.64	105,504.42	98,286.22	15,000.00
Jacksonville Electric Co., Jacksonville, Fla.	R. & L.	22.25	305,639.91	180,865.90	124,774.01	37,856.41	86.917.60	52,000.00
Lowell Electric Lt. Corp., Lowell, Mass.	L.	....	254,935.31	155,305.69	99,629.62	9,420.08	90,209.54	52,000.00
Minneap's Gen. Elec. Co.,The,M'n'p's,Minn	L. & W.	....	724,581.91	383,801.35	340,780.56	111,710.00	229,070.56	60,000.00
Northern Texas Trac. Co., Ft. Worth, Tex.	R.	66.70	661,036.89	391,862.75	269,174.14	118,127.38	151,046.76	75,000.00
Paducah Traction & Lt. Co., Paducah, Ky.	R. L. & G.	12.80	....	....	....	....	......	......
Ponce Electric Co., Ponce, Porto Rico.	R. & L.	4.30	88,573.80	56,391.53	32,182.27	28,443.74	3,738.53	......
Puget Sound El. Ry., Tacoma, Wash.	R.	52.22	511,338.88	304,034.23	207,304.65	180,501.32	26,803.33	......
Proportion of earnings of Tacoma Ry. & Pr. Co.	......	....	....	....	....	....	65,804.25	....
Puget Sound Power Co.	W.	....	....	....	....	....	......	....
Savannah Electric Co., Savannah, Ga.	R. & L.	57.49	586,235.95	348,027.00	238,208.95	127,694.13	110,514.82	60,000.00
Seattle Electric Co., Seattle, Wash.	R. & L.	108.70	2,565,913.81	1,674,011.93	891,901.88	291,648.99	600,252.89	288,000.00
Tacoma Ry. & Pr. Co., Tacoma, Wash	R.	85.95	657,451.22	451,581.20	205,870.02	132,802.87	73,067.15	....
Tampa Electric Co., Tampa, Fla.	R. & L.	30.53	411,763.26	237,153.38	174,609.88	21,765.84	152,844.04	70,000.00
Terre Haute Tr. & Lt. Co., Terre Haute, Ind	R. & L.	76.23	629,760.38	414,517.51	215,242.87	122,418.20	92,824.67	....
Whatcom Co.Ry.& Lt.Co.,Bellingham,Wash.	R.L.G. & W.	16.84	195,009.02	136,395.62	58,613.40	29,299.15	29,314.25	11,700.00

NOTE.—R—Electric Railway. L—Electric Lighting. G—Gas. W—Water Power Development.
* Blue Hill St. Ry. Co., deficit. † Galveston Electric Company, 8 months. ‡ Houghton Co. St. Ry. Co., 6 months.

LIBRARY AND DOCUMENT FILING

This department receives, extracts and files copies of the representative technical periodicals, the local papers published in the communities served by the individual properties, and technical and engineering text books, hand books and publications that may be required for reference purposes. It is also responsible for the proper filing and indexing of all documents, such as agreements, contracts, reports and similar papers, in connection with the affairs of the head office and the allied properties.

In connection with the handling of the technical publica-

tions and literature, an important feature of the work is the preparation and issuance of what are termed "current literature sheets." As the various periodicals are received they are first read by an experienced reader, who notes special articles or information that may be of interest to any of the departments or individual members of the staff, or to any of the local managers. The current literature sheets are then made up periodically from these notes and copies are circulated among the staff of the Boston office and to the local organizations. The sheets give the titles of the articles and the page and issue of the publication in which they appear. This service is not intended to take the place of personal reading of current literature on the part of individuals, but its object is to encourage examination of the technical papers, by keeping all members of the organization posted as to the articles that are appearing in the technical press. The department is also of service in securing individual subscriptions to the periodicals at club rates.

MISCELLANEOUS DEPARTMENTS

The Boston offices of the firm occupy two and a half floors of the modern office building at No. 84 State Street. The suites have been laid out with the needs of each department clearly in mind, and with the view of expediting the intricate details involved in the dealings of the firm with outside interests and within its own organization. The miscellaneous departments include a separate stenographic bureau in addition to the special departmental stenographic assistants. It also comprises an elaborate and comprehensive system for handling mail, telegrams and correspondence in general, including arrangements whereby incoming letters are opened, numbered, recorded and routed through the proper channels, and means for making sure that every individual letter received is properly answered and then filed. The system also embraces the collection, copying and checking of outgoing mail.

EARNINGS

It is the policy of Stone & Webster to give out information regarding the earnings and the condition of the companies managed by the firm. A list is given on the opposite page of all the properties controlled, with a statement of operating results for the last fiscal year.

[Note—Since the foregoing description of the Stone & Webster organization was prepared, a separate engineering and construction company has been organized by the firm to take over the engineering part of its business.—Editors.]

LIGHTING CURRENT SUPPLIED BY A RAILWAY

Except for lighting purposes, not much effort was made by the Kokomo, Marion & Western Traction Company, of Kokomo, Ind., toward the introduction of electric current for use in the home until the beginning of this year. Since that time, however, this company has been experimenting, and as a result has undertaken a systematic campaign for extending and augmenting their general lighting and power business

The company has already placed orders for additional electric and power equipment to take care of the new business. The company now handles at one station the electric lighting of Kokomo and Swayzee and also the street railway system of Kokomo and the interurban railway between Kokomo and Marion. The new equipment now on order consists of a 1000-kw Allis-Chalmers turbo-generator unit, wound for 60 cycles, 2300 volts, three-phase, which corresponds with the current generated at present in the company's plant for distribution in Kokomo. It is there stepped down and supplied to the interurban railway and for lighting at 208 volts on the three-wire system.

SARATOGA MEETING OF THE NEW YORK STATE ASSOCIATION

As outlined in the last issue of the STREET RAILWAY JOURNAL, the twenty-fourth annual meeting of the Street Railway Association of the State of New York was opened on Tuesday morning, June 25, at the Grand Union Hotel, Saratoga, N. Y., and continued until the afternoon of the following day. In all three sessions were held, two on Tuesday and one on Wednesday. All of the meetings were well attended, and great interest was manifested in the several reports and papers presented. The president's address, the reports of the special committees, and the papers read at the two sessions on Tuesday were published in the last issue. In this week's issue are published the paper by Mr. Carver read on Wednesday morning, together with an extended abstract of the discussion and proceedings at all the sessions during the convention.

TUESDAY MORNING SESSION

After the reading of the president's address (for the address in full see page 1032 of the last issue) and the general business of the association had been disposed of, the report of the committee on standard application blanks and forms (for report see page 1029 of last issue) was received, and was referred to a later meeting for discussion. The report of the committee on collection and compilation of mechanical costs (for this report see page 1029 of the last issue) was next taken up.

Secretary Fairchild, as a member of this committee, outlined what the members had in mind at the time they made up their report. At the Schenectady meeting, which was devoted to the discussion of mechanical costs, there were presented a number of records on the cost of various items, but as the records had not been kept in the same terms it was very difficult to reduce one road's records to the terms of some other road. The item was often similar but the particulars as to what details had been included in each case were confusing. The committee was appointed primarily to decide upon a common basis so that the members of the association could make up cost records in the same terms or units of comparison. The members of the committee knew that they would get into deep water if they tried to do too much, but they decided that something could be done to make a start. In making up the forms recommended, the committee went over the standard classification of accounts and selected those items which appeared to be the most important and which would help to start the ball a-rolling. The suggestion of the commitee is that the members of the association, starting July 1, keep records as to the cost of the various items included in the blank forms so that at a future meeting it will be possible for members to compare costs of the individual items and possibly arrive at some conclusion that will help the high men to get their figures nearer the average. The committee requests a discussion of these items and of the blanks in general. It took some little time to get up a convenient blank and decide the arrangement. The committee decided that the forms submitted were about the simplest, but as this was intended only as a preliminary report, any suggestions as to the arrangement of other items that could be included in the final report would be very acceptable. C Gordon Reel asked if it was intended to include in the cost of the items the cost of labor in installing. The secretary replied that the committee thoroughly canvassed that subject and decided not to include the cost of the labor for making the actual installation on the car, as many roads do not keep their accounts in as great detail as that. The committee felt if it tried to include too much it would not accomplish anything. It was the sense of the committee four of whom are

active master mechanics, that it would be easier to get the cost of these items up to the point where the articles are ready for the car than to attempt to secure also the cost of putting them on the car, because, in the judgment of the members, the records of few companies are carried so far. In answer to a question by a delegate, Mr. Wilson, of Buffalo, said it would simplify matters by leaving out the cost of installation.

The secretary also explained that the committee was particularly anxious to secure the cost of maintenance of motors by types as called for in the forms, so as to get data for comparative purposes with different roads, and also for comparisons of various types on the same road under different conditions. Space was therefore left on the blanks under "armatures" and "field coils" for filling in the type of the motor. In considering such units as car-miles, wheel-miles and motor-miles, the sense of the committee was that the items should be kept upon the logical basis in taking up any particular item. The committee recommended, however, that every road fill in the thousand-car-mile record on practically all the items, as this is the simplest basis, but it also recommended that all the roads fill out all three columns where the figures will apply, namely, car-miles, wheel-miles and motor-miles. For instance, brake shoes would require car-miles and wheel-miles but not motor miles.

The committee realized that if it made its report complicated the recommendations would call for considerable clerical work in the master mechanic's office. The members were anxious to make the recommendations so simple that there would be no excuse for not following them. In the judgment of the practical men on the committee the records proposed can be kept by practically every road with but slight changes in the accounting department of the master mechanic's office. In some cases slight changes in the method of accounting may be required, but it was realized that if the report required the aid of an extra clerk but few figures would be forthcoming, but that if the cost of keeping the records was not increased the roads would be willing to carry out the suggestions.

Mr. Pardee, of the Rochester & Eastern, said in his opinion the great advantage of the report was that all the companies will attempt to keep the data necessary, unless they find it too expensive, as it will make it possible for one road to make comparisons on the same basis with another road of the same description. As it is now, the average reports covering car mileage as statistics do not give accurate results for comparison, but with these blanks specifying mileage records on particular items it would be possible to make accurate comparisons. He cited as an example that he had found trolley wheels on his road were costing more than on the Utica & Mohawk Valley Railway. He was trying to find out why, but it took both roads some time to reduce their figures to get the same basis. With the blanks submitted in use this would be accomplished right away.

Mr. Wilson, of Buffalo, agreed with Mr. Pardee that this report was very valuable. It might need some whipping into shape, and he therefore moved that the report be accepted as presented and the committee be continued to correspond with different roads to see how the suggestions work out in practice, and at the next meeting present another report.

Before the motion was put the secretary asked if the companies represented thought they could reach the results desired without a great deal of trouble. A number of delegates present answered that they could secure these results without much trouble or complication.

Mr. Pardee offered an amendment to the effect that the committee prepare and send out to all roads in the State in the near future a list of instructions as to its ideas of how the records should be made up so that all the members will be able to keep the forms on the same basis. The motion, with the amendment, was carried.

The report of the committee on interchangeable coupon books, of which J. H. Pardee was chairman, was then read. (For this report in full see page 1027 of the last issue.) On closing his paper Mr. Pardee suggested that a discussion of the matter be taken up later, after each delegate had read the contract, and report presented by the committee.

Mr. Fassett, of Albany, chairman of the committee on rules, stated that his report was not yet ready, but would be presented at a later meeting.

The report of the committee on revision of the constitution and by-laws was then read. The report, which provides for associate and allied membership in the New York State Association, will be found on page 1030 of the last issue. The secretary explained that the creation of the allied member class was brought about by the recognition on the part of the executive committee of the desirability of formulating a definite and positive policy in regard to the association's good friends—the supply men. The association wants the supply men at its annual meetings, and this allied membership was created to give them a definite standing in the association. The associate membership was created for those railway men from neighboring States and Canada who attend the meetings and should be recognized in some form.

Emphasis should be laid on the point that the executive committee in formulating this recommendation wished distinctly and positively to put itself on record as having no desire or intention of encroaching upon the field of the American Street and Interurban Railway Association and its allied associations. The national association has planned a broad scheme of policy and endeavor which it is carrying out well, and the executive committee of the New York State organization wishes to disclaim any intention of belittling or interfering with the parent association's work by taking members or opposing its progress in any way. On the other hand, the New York Association has gone on record repeatedly as wishing to extend co-operation and assistance to the parent association in every way in its power. But as Mr. Stanley had remarked, there are a number of companies near New York State that have no affiliation with a sectional organization. A sectional organization affords a simple and convenient method of getting together oftener than once a year to thrash out important problems. The idea of extending the scope of the association to take in these other roads is that they may have the advantages of a sectional association, and the New York organization is therefore glad to invite them to co-operate with it in work of this kind.

Mr. Cole, of Elmira, believed that, as the association is gradually establishing standards through the State, any engineering or manufacturing and supply firms affected by these standards should certainly be admitted to some class of membership, because the changes adopted by the electric railway companies of this State indirectly affect the business of the manufacturing and supply men. He therefore thought that they should be given recognition.

Mr. Fassett, of Albany, agreed with Mr. Cole. The only criticism he had to make was that the dues were too small. The fee should be $50 and $25 instead of $25 and $15 for the members and associate members respectively.

Mr. Stanley, of the Public Service Corporation of New Jersey, said that the corporation which he represented in the State of New Jersey would be more than glad to have the privilege of affiliating itself with the New York State organization in an active way. Those familiar with the conditions

in his State would appreciate the difficulty of forming any association in that State, as it would be in the nature of a family party. He believed that the railways contiguous to the State of New York should become actively identified with the association.

Mr. Allen, of Utica, thought it would be a mistake to make the dues for associate and allied members higher than $25 and $15, respectively, as those amounts had been decided upon after careful consideration on the part of the executive committee. The New York State association is operating to-day under changed conditions due mainly to the fact that the conditions of five or ten years ago in railway matters have changed considerably. The association now holds quarterly meetings, and it has been found the work done at these quarterly meetings has been of the greatest value to the practical operating, mechanical and electrical men. These meetings have been attended by representatives from companies outside the State, and the New York organization is desirous of continuing to benefit by their presence and attendance at the discussions. In connection with this subject the question of dues for active members has been thoroughly discussed by the executive committee. There is a feeling on the part of a large number of roads that the present fees are excessive. If the allied and associate members are taken in at reasonable cost, then the full membership dues can be somewhat reduced. It takes about $5,000 to run the association each year. That cost can be somewhat reduced by dispensing with some of the features—particularly entertainment at the annual convention. Speaking in relation to allied membership, Mr. Allen said in the past four years the association had had four different policies toward the supply men. One year there was an exhibit, and the next year none. One year the supply men were charged for a banquet ticket, and the next year a ticket was included in the registration fee. By taking in the supply men as allied members the association can hereafter pursue a definite policy and co-operate with them. The speaker believed the suggested increase in allied and associate membership fees made the fees too high, and it seemed to him that the figure given in the original report should be adopted. It might be well to have further expression upon this subject before the motion was put.

President Danforth, speaking for the executive committee, said the committee in its recommendation as to fees put the dues as high as was believed to be fair and reasonable. It is hoped in another year the full membership due can be put on a more equitable basis. He believed Mr. Allen had expressed the sentiment of the executive committee very clearly, and hoped the report of the committee would be adopted as presented. Mr. Fassett then withdrew his suggestion and moved that the report be adopted as read. The motion was seconded and carried. A recess was then taken for luncheon.

TUESDAY AFTERNOON SESSION

The entire afternoon session was devoted to the reading and discussion of three papers on the "Sale of Water Power," one by S. B. Storer, general manager of the Niagara, Lockport & Ontario Power Company; Charles E. Parsons, chief engineer Hudson River Electric Power Company; and G. A. Harvey, electrical engineer International Railway Company, of Buffalo. These papers were printed in full on pages 1016 to 1027 of the last issue of the STREET RAILWAY JOURNAL.

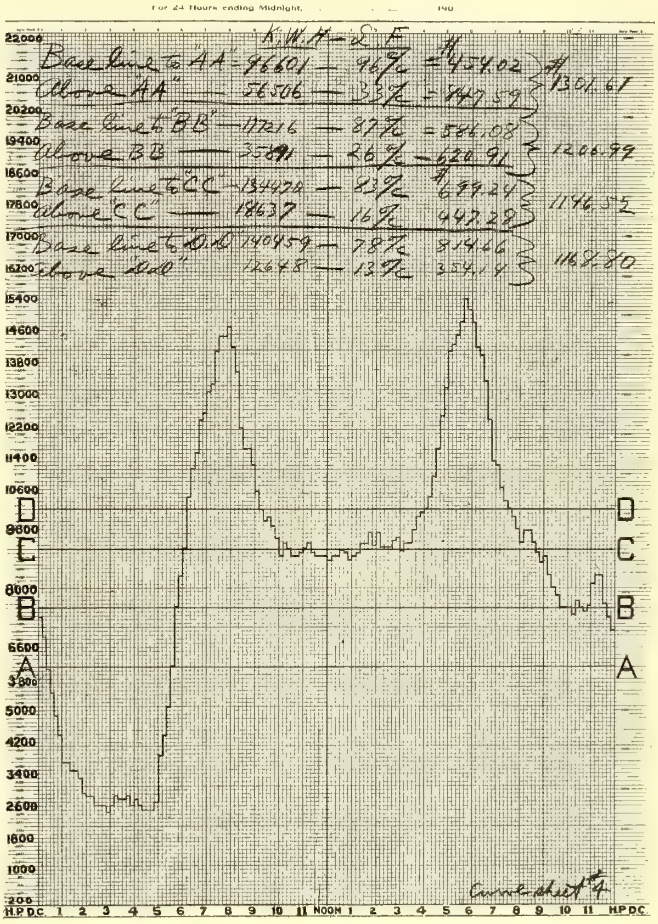
In opening the discussion, G. A. Harvey presented three additional curves and an extended explanation of them as an addenda to his original papers. This additional matter will be found below.

As an example of the economical location of the firm line of purchased hydro-electric power, the load curve shown on sheet No. 4 is submitted. The experimental firm lines are located on the total load curve at the points AA, BB, CC and DD.

With the firm line at AA there are 96,601 kw-hours, with 96 per cent. load factor below the line, costing $454.02, and 56,506 kw-hours with 33 per cent load factor above the line, costing $847.59, or a total power cost of $1,301.61.

With the firm line at BB there are 117,216 kw-hours below the line, with 87 per cent load factor, costing $586.08, and 35,891 kw-hours above the line, with 26 per cent load factor, costing $620.91, or a total power cost of $1,206.99.

With the firm line at CC there are 134,470 kw-hours with



CURVE SHEET NO. 4

83 per cent load factor below the line, costing $699.24, and 18,637 kw-hours with 16 per cent load factor above the line, costing $447.28, making a total power cost of $1,146.52 for this location of firm line.

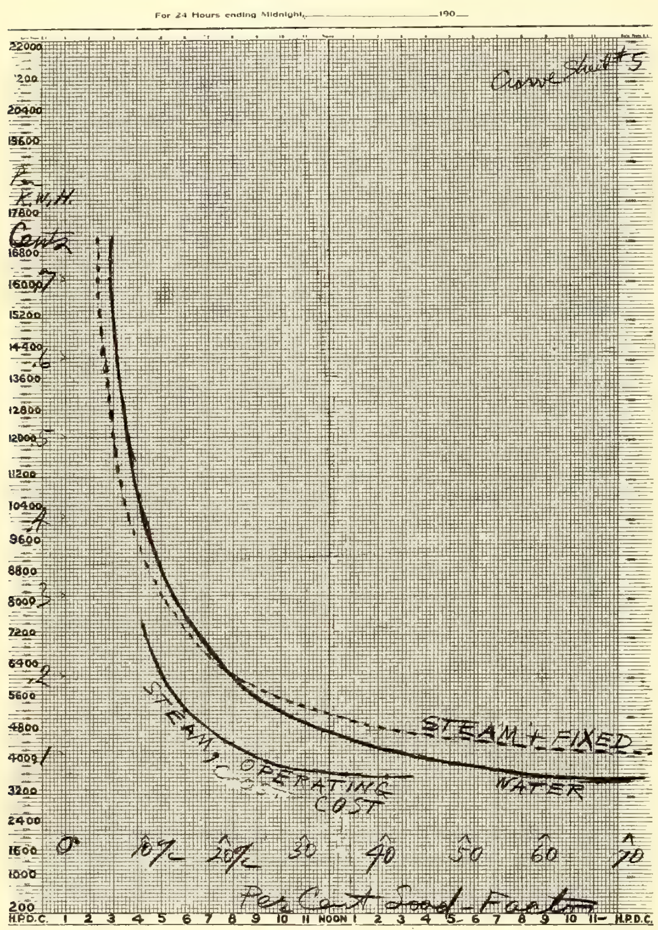
With the firm line at DD there are 140,459 kw-hours below the line, with 78 per cent load factor, costing $814.66, and 12,648 kw-hours with 13 per cent above the line, costing $354.14, or a total of $1,168.80.

These costs are based on the assumed figures of $50 per horse-power year at 100 per cent load factor for steam power, and $30 per horse-power year at 100 per cent load factor for hydro-electric power, as shown on curve sheets No. 1 and No. 2 of Mr. Storer's paper on "Sale and Measurement of Power."

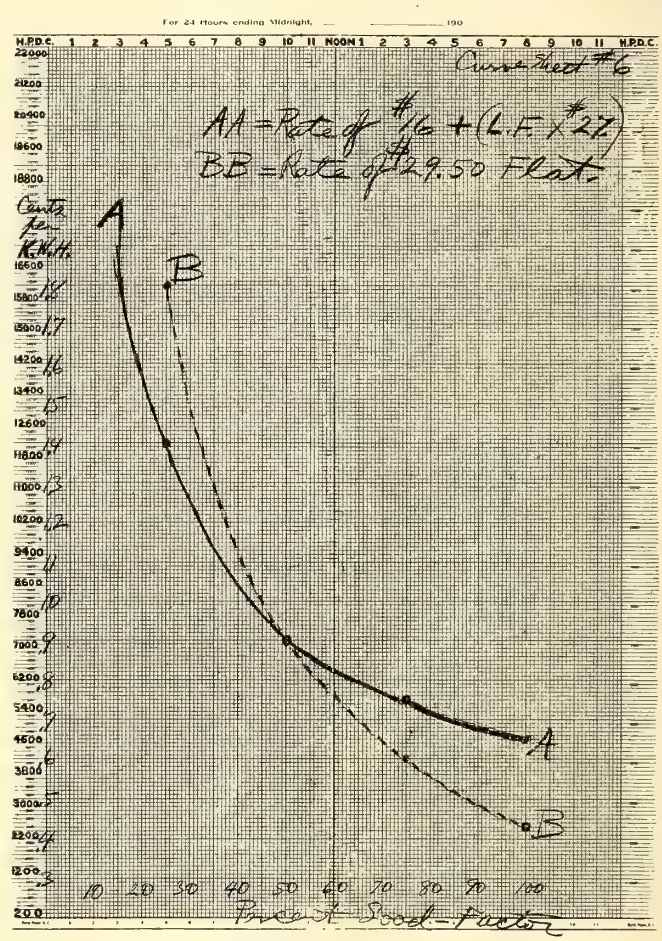
It is to be seen that in raising the firm line of purchased power from point AA, the total cost decreases up to the point CC, and then increases at the point DD. The economical location for the firm line at these prices for power is, therefore, somewhere in the neighborhood of the line of CC, which represents, as previously suggested, the base of the fifteen-hour load peak.

As mentioned in the last paragraph of the paper on "Con-

tracting for Use of Hydro-Electric Power," the fixed charges on the steam plant should not be considered in determining the relative amounts of steam power and purchased power to be used, but merely the operating costs should be considered in connection with the steam power in this case. (The fixed charges on the steam plant still enter into the total cost of power.) Curve sheet No. 5 shows a reproduction of Mr. Storer's curves on his sheet No. 2. There is added, however, another curve showing operating cost only of steam power per kilowatt-hour at various load factors. Using figures derived from this latter curve, the firm line of purchased power would obviously be located at a lower point than *CC* on sheet No. 4, and instead of the steam plant being economical only under conditions where the load factor is 20 per cent or less, it is economical over a considerably greater range, as the curve of operating cost of steam plant will cross the water-power curve at a point somewhere near 50 per cent load factor.



CURVE SHEET NO. 5



CURVE SHEET NO. 6

Taking Mr. Storer's example of a rate per horse-power per year of $16 + (load factor by $27), and plotting this in terms of cost per kilowatt-hour at various load factors, we have a curve as at *AA* on sheet No. 6. As power companies seldom hesitate to offer a flat-rate contract, it would seem that the rate depending on load factor could be appropriately compared with the flat rate which comes closest to the same effective cost per kilowatt-hour. Such flat-rate would be the one which equals at 50 per cent load factor, the 50 per cent load factor of the $16 + (load factor x $27) rate. This flat-rate curve is shown at *BB*, and represents a rate of $29.50 per horse-power per year. There is an inconsistency in this, as the rate depending upon load factor makes the cost to the customer lower at a low load factor and higher at a high load factor, which is contrary to the arguments which are always presented by power companies. This same inconsistency exists in the rates shown on curve sheet No. 1, but the differences between the lines are not so great.

DISCUSSION ON WATER-POWER RATES

Mr. Cole, of Elmira, referring to Fig. 1 of Mr. Storer's papers, pointed out that the cost per horse-power per year increases rapidly with the load factor. There is no question about that. In Mr. Parson's paper the author says: "The load factor is the third and most important item in determining the cost of power, load factor being the ratio of average to maximum load. It is evident that when the load factor is near 100 per cent all of the machinery is in operation on all parts of the system, and the transmission lines are carrying their full load." Mr. Cole pointed out that the same thing applies to the steam station apparatus. He said this could be explained by taking a chart, drawing on it a circle, and dividing that circle into twenty-four hour periods on the outside line. Then draw an inner circle representing the firm load, and beyond the outside circle have an angle representing the peaks of load above the hydro-electric power loads. It will then be found that the steam load peaks have increased almost in proportion to the slant of the line of the angle. The steam apparatus is working at the point of economy when it is carrying a normal rated load, but when used for carrying peaks there is put upon it the kind of load which is most expensive. Unless a storage battery is installed to carry a given load beyond the normal load, the cost per kilowatt-hour of these peaks will be brought up to about 20 cents, which can be demonstrated. The question of determining just what can be carried is a difficult one. For instance, on a station carrying 5000 kw (which is the figure used generally on comparisons of stations) there may be a firm load of anywhere from 3000 kw to 3500 kw, but

a storage battery would have to be used in conjunction. The peaks of about 500 kw run from one-half hour to an hour a day. In carrying such a load on an auxiliary steam plant it would be necessary to charge up to say 20 cents per kilowatt-hour for the peak power. On many roads in the summer months, where there is a pleasure ground, it is sometimes necessary to start off thirty to forty cars in say half an hour. Yet this peak period may come on only twice in twenty-four hours. With an electric light plant there are many large office-building loads coming on for about an hour a day. Still the company must pay for the twenty-four hours on account of that hour where the load runs above the firm load line.

Mr. Harvie, of Utica, said his company purchased hydro-electric power on the kilowatt-hour basis, and from their standpoint this method seems to be all right.

Mr. Wilson, of Buffalo, agreed with Mr. Harvie, of Utica, on the way to pay for power. When a company can get down to a kilowatt-hour basis it knows what its power is going to cost. The speaker did not like the sound of anything based on peaks—whether they are one-minute or two-minute peaks. Mr. Harvey, of Buffalo, had figured it out for the Buffalo proposition, and found it very much more expensive to buy power based on peaks. It figured out about $30,000 more a year than on the kilowatt-hour basis. Mr. Pardee, of Canandaigua, asked what was the difference between one-minute and two-minute peaks, that is, as to whether the two-minute peak could be allowed with safety by the power company instead of a one-minute peak. It appeared to the speaker that a two-minute peak could be allowed as well as the shorter one, as the difference to the railway company seemed to be much more important than to the power company. For instance, in the plant described by Mr. Parsons the turbines have considerable overload capacity. It is quite unusual that the turbines should be rated so much higher than the generators. There are a great many characteristic curves in the turbines. For instance, one turbine runs down very rapidly in efficiency after passing the rated load of the generator. In the case of Mr. Parsons' plant, a two-minute peak should be no hardship at all. If the machines had no overload capacity it would be more of a hardship.

Mr. Storer said, in reference to one or two-minute peaks, that in connection with the system of charging explained in his paper, if a two-minute peak is used it would mean that the probability of peaks overlapping on different railway or other loads is increased just double. The power company could not oversell its plant with two-minute or longer peaks as easily as it could with one-minute peaks. Whatever peak is used the cost must eventually come back to the same thing, based on the requisite amount the power company must get for the maximum output from its station. The speaker had found in the negotiations he had had with power customers that they all look at their individual conditions and try to get a time limit on their peaks long enough to take in their maximum demand. For example, one customer had a load to carry up a hill which would mean a fifteen-minute peak. The customer thought the power company ought to sell him power on a fifteen-minute peak. It does not make any difference what the peaks are, the income must be a certain amount, and if the load factor is based on a one-minute peak to determine the cost per kilowatt-hour, it all comes to the same cost per kilowatt-hour, because the kilowatts consumed on a five-minute peak are more than on a one-minute peak. As far as the question of selling power on a kilowatt-hour basis pure and simple with a guaranteed load factor is concerned, the consumer runs against the same thing as on the maximum demand basis. From the Niagara, Lockport & Ontario Power Company's standpoint, that company considers it much more to the consumer's advantage to be permitted to take these peaks and pay for them only when they occur, rather than have the circuit breakers throw off the entire load and interrupt the service if only for a few minutes. According to Mr. Cole's remarks on peak loads, he counts the load he gets in the summer time for the park service as put on as an addition over the firm load line. On top of that he puts the lighting load from buildings and some other kind of power service. The chances are that in Mr. Cole's particular case the park load in the summer time will come at a time after the ten-hour factory load is off. It will also come at a time when the lighting load in offices is not a factor. Therefore, taken as a whole, the same law of probability would enter in that case. The point of measurement being the same for all of these different usages, the total peak would be very much reduced below the individual peaks of each class of service supplied by the buying company. Therefore the retail company could oversell this purchased block of power in the same way that a power company can oversell the capacity of its plant.

Mr. Royce asked why Mr. Harvey in his paper omitted the fixed charges on his steam plant. The fixed charges must be paid, and the speaker did not see why it is fair to omit them in figuring how much power you can buy. Mr. Harvey answered this question in the addenda to his paper published elsewhere in these proceedings.

Mr. Allen, of Utica, did not feel that everybody should be afraid to discuss this power question. Approximately 17 per cent of the gross receipts of the electric railways in this State are paid out for power, according to the report of the State Railroad Commissioners. The Superintendent of Public Works, in his annual report four years ago, called attention to the fact that the State of New York, aside from Niagara Falls, had more undeveloped water power than any other State in the nation. It seems to have taken us a long time to discover that hydraulic plants are available as a source of cheap power. It also seems to be a fact that when a traction and power company begin to negotiate they start from a common point but proceed in opposite directions. In California there is one water-power company that furnishes all the lighting and moves all the traction lines north of Fresno. There are something like sixty plants making up this high-tension transmission system. The prices which the power company has named to the power and lighting interests have been somewhat less than those quoted to customers by the Eastern power companies. The question of whether hydro-electric power is the right thing for a traction company to use depends, first, upon the price, and, second, upon the quality of the service. If the price and service are as good as with a steam plant, there is no doubt that the traction interests are suffering by not purchasing hydro-electric power. Whether such power service will prove satisfactory or not depends a great deal upon the form of contract. In the past five years the Utica & Mohawk Valley Railway Company has had three forms of contract, two unsatisfactory and the third satisfactory. It has been operating under the latter since July 1, 1905, and it has proved mutually satisfactory. The first contract was for block or firm power to be paid for at so much per horse-power per year, measured by a horse-power meter. The maximum demand for the month was to be regarded as 75 per cent of the average maximum demand, and was to be paid for at the rate of $25 per horse-power. All power in excess of this 75 per cent was to be paid for at $33 per horse-power per year. That was not satisfactory either to the railway company or to the power company, and was repudiated by both. As an arbitrated agreement the

railway company purchased power for two years on the kilowatt-hour basis, the railway company having no power plant that it could use. The price in that contract was so high that instead of paying 16.66 per cent of the gross receipts for power, the railway company paid 32.8 per cent for two years. The present contract is not wholly a kilowatt-hour contract. The railway guarantees a minimum load per month, and if the total kilowatts used in one month do not clear a certain amount the railway must pay the minimum anyway. There has been but one month when the total kilowatts used has fallen below the minimum. The quality of service that has been received in the past year has been one that the speaker is glad to speak of favorably. It has been satisfactory in every way. The contract, besides being an hydro-electric contract, embodies two other features which have not been spoken of. As a supplemented contract there is a a steam-power plant which the power company maintains and agrees to have ready for operation on thirty minutes' notice; the other is the penalty feature. If the power for any one day be deficient for thirty minutes, there is such a penalty that if these deficiencies continued for thirty consecutive days in one month the power company would owe the railway company money. But the railway has never yet had to penalize the power company. It seemed to the speaker that in any question of such vital importance as the cost of power the members ought not to sit down and be afraid to talk about it. He asked Mr. Wilson, of Buffalo, to give his experience.

Mr. Wilson said the International Railway has two forms of hydro-electric contracts, one for the city lines and the other for the Lockport interurban division. In Buffalo the railway pays a certain price per horse-power per year for 7000 hp firm. In summer the company shuts down the steam plant. The company pays for peak loads at a certain rate per kilowatt-hour. In the winter the railway carries the peak load with a steam plant and batteries. On the interurban contract the company pays a certain price per horse-power year, and has a sliding firm line such as Mr. Harvey recommended, and excesses are paid for at a certain price per kilowatt-hour. The total cost per kilowatt-hour is $.0067. The price for Buffalo the speaker considered high. It is a long-term contract which was entered into some time ago when the power business was new and the railway was new. The speaker believed the price per kilowatt-hour given compares favorably with modern steam plants. He asked what was the cost of power in New York City. Mr. Root, of the New York City Railway, replied about $.006 per kilowatt-hour. Mr. Wilson thought the main objection to water power is the possibility of interruption. A modern steam plant is practically continuous. His company considered the water-power service last year was pretty fair. Before that they had considerable trouble, principally on account of ice.

Mr. Cole, of Elmira, asked Mr. Harvey, of Buffalo, if there is no interest on the fixed charges of the steam plant to be counted against steam power, is there not an operating charge on account of its "readiness to serve"? The power station men are there and the boilers are fixed up for use during a short period, while for the other six or seven hours the men will be doing work for which otherwise cheaper labor could be used.

Mr. Harvey replied that in the case cited the economical point for this line is on the fifteen-hour line. At such a point, where the station carries a load for fifteen hours or more, there would have to be two shifts of men anyway. As to the matter of dropping out the fixed charge on the steam plant, the speaker explained that this charge is not to be ignored in the total power costs. Mr. Pardee, of Canandaigua, said he had made some careful calculations on the use of water power, and the "readiness to serve" came up in one of the propositions. He found that the readiness to serve the peaks (which were liable to come almost any time) would be about 80 per cent of the cost of what little power that steam plant would have to furnish. The actual coal and wages that would be needed amounted to a very small proportion of the total cost, the remaining cost being the expense for having the men ready on three minutes' notice.

The meeting then adjourned.

WEDNESDAY MORNING SESSION

The meeting Wednesday morning was called to order at 10:30, and after announcements had been made concerning the various trips and excursions for the day, D. F. Carver, general superintendent of the Rochester Railway Company, read a paper on "Car Inspection and Cleaning," giving some of the results of trip inspection as compared with night inspection, concerning which subject the author read a paper at the Schenectady quarterly meeting of the association in January. Mr. Carver's paper follows:

CAR INSPECTION AND CLEANING

The roadbed and track may be the finest in construction; the alignment and grades may be the result of much money expended; the power house may have all the appliances and up kinks for keeping the current on—as nearly as may be—constantly; it may even be a double-tracked suburban line, and if a single-track high-speed one, its despatching system may be perfect; the crews may be most thoroughly trained and efficient; the motor equipments may have much surplus capacity and be of the most reliable design,—but, if there is not a regular and efficient equipment and car inspection the trains do not get over the road; the traveling public becomes dissatisfied at delays which it cannot account for, and blames the management for some vague shortcomings which it does not understand—but perhaps may think it does.

This subject of regular and systematic inspection is a very old one on railways. It is so old that it surely is self-evident, but in the drive of every-day business on our fast-growing electric properties, whose equipment is required to run excessive mileages at long periods of the day, the question of thorough and systematic inspection becomes of less and less importance in the pits, behind the front doors of a good, warm car house, as the day grows from midnight on to 4 a. m., or perhaps later. But as we sit in our offices the next day, and read our daily reports of crippled cars that had to be turned in, and of cars which started to go there out on some interurban and never got back (on time), then the subject of car and motor inspection is a most important one, worthy of most serious consideration and attention by the management; and as the present time here is practically the same as we give to it at home, I ask that we should approach it with the same amount of care.

Car inspection and cleaning is expensive, there is no getting away from it. It is expensive if you do, and it is also expensive if you do not. One can take his choice. The accountant does not bother his head about it. If things go right and regular he puts it into No. 20; if they go a little at odds with their surroundings he puts it into No. 33. How fortunate for us superintendents that it is not No. 23.

There isn't any legitimate way that a street railway company can better advertise itself to attract chance business than through the operation of cheerful, painted, polished cars, with clean interiors. The aesthetically beautiful car, in a town of hustling business and civic pride, will draw enough more trade (passengers) than a dingy, dirty, unkept car, to pay the additional cost of its upkeep. There would not be any doubt about this if we all thought alike, or at least acted alike.

But there are bulls and bears in railway properties. The one builds a property to its maximum efficiency and earning power, and spends a small surplus above actual bed-rock needs in keeping the property in the condition in which all should keep theirs; but he is Mr. E. Z. Mark for the bear operator looking for other fields to conquer, and one must not admit too much in the presence of the other; neither must he lay himself open to too much criticism from the other; so to protect ourselves we all run just a few dirty cars now and then. But seriously speaking, the cleaning of cars is slowly becoming a too elaborate and unwieldy operation for street railways to keep up, and it is now up to some one to get his inventive genius to work and devise some method of doing it at least more quickly, if not more cheaply. With water and waste, and a little of the right kind of soap—applied with the right proportion of elbow grease—at a moderate temperature of air in the winter time, the outside of a car can be cleaned up and polished with neatness and despatch. But the inside of the modern cross-seat city car is different. The small space behind the hot-water pipes collects any kind of rubbish, provided its bulk is not prohibitive; if so, it then goes under the seats between the footrests, which is not so bad at that, for it can be gotten out by the car cleaners without taking the car apart.

And then there are the windows and upper deck; the headlinings and lamps; and disinfectant now and then until it sums up to 30 cents to 50 cents a day to keep a car clean, depending on the size of the car—nearly as much as Madam spends in keeping her ten-room house sweet and clean; half as much as the steam railway division spends in keeping its palatial equipment spick and span. And the end is not yet, until some one devises a simpler and better method of interior car cleaning.

Far be it from the writer's intention to argue for a less beautiful or ornate car interior; but there must be a demand, sooner or later, for simpler methods, and quicker ones, in car cleaning, and this may be helped along by some changes in the floor work of our cars.

Whether or not a car should be cleaned in an operating depot, as it stands over pits and in amongst other cars, at any temperature that may happen to be in the shed at the time, or whether it should be cleaned in a separate wash-house, where water is plenty, drainage is good, temperature is right, and where it may stand protected in winter until thoroughly dry and in summer protected from dust, is a question to be argued on at this meeting. I hope we can settle it. We are doing on our own road now what we think is best, and would like to have it settled, naturally.

There is the question of cost, and also the inconvenience of shifting all cars into and out of a special house to clean them. It would be very interesting to the writer to listen to a further discussion of the matter from those who are doing one way or the other, or both.

Some months ago the writer had the honor to write a paper for this association, advocating trip inspection on a line where the time for inspection between cars was never more than eight minutes, sometimes less than six minutes. We were at that time making the experiment on one of our lines to see for ourselves if an inspector could really inspect, in such a limited time, or whether it was all a bluff. The result to date may be of some interest.

The per cent. of cripples to cars operated in January on this line was 5.55 per cent lower than the average of all other lines. In February it was 7.37 per cent. lower. In March it was 6.78 per cent lower. In April it was 5.20 per cent lower, and in May it was 5.09 per cent lower.

Long ago, when the only books written on railroading were English; long before they ever thought of electric railroading; long before there was any one in America who had the requisite knowledge of railroading and at the same time the leisure to write about it, they used to publish a story about the great George Stephenson, the builder of the first successful locomotive and the builder of the first successful road on which to run his new locomotive, that when he was before the English Parliament arguing for the right to build his railway, some one asked him how he was going to make a highly-polished rim of a driving-wheel stick to a rail—perhaps just as smooth—and pull anything, and the once mine boy said in reply that he didn't know how it was done, but he'd do it. Perhaps it is the same spirit working in the mind of the man in overalls that keeps the cars moving on such short time for inspection. They may not be able to tell you, scientifically, how they do it, but they can surely do it.

As for the car bodies themselves, there is really very little need for systematic inspection as a specialty. The crews can report on proper cards the damaged condition of any car body, in ample time to avert trouble, and experience has shown that they are entirely capable of doing so. Then the art of car building has so progressed that one can tell which part at a general overhauling will not last till the next one, and can replace where necessary.

Broken glass is the cause of much trouble and expense between shoppings, but there is no help in sight for that. Some have tried using plate glass, which shows a smaller percentage of breakage but still at higher cost than the thin glass, so its use is very limited. It might be well to try a combination of AA glass and plate glass, instead of using all one kind or the other. There are a number of lights in the average car which, if of heavy glass, would not break easily and would still be comparatively cheap because of small size. Custom has established that the panes in the vestibule shall be large and in one piece in the sash, but they are too large for durability and are constantly being broken. There would be much less breakage of glass in the side windows if they were counterbalanced and then heavier plate used, but the counterbalancing mechanism is not for the street car, and there is no relief from that quarter.

If the inspection force has any motto at all it should be that "it is easier to produce the results required than it is to make excuses for failure."

DISCUSSION

In reply to a question as to whether with the trip inspection the night work could be done away with entirely, Mr. Carver replied that, while it would be an advantage to abolish night work, a certain amount of work must always be done at night.

Mr. Hanf, of Buffalo, asked if there was a pit at the end of the line for the trip inspection. Mr. Carver said no special pit provision had been made for this inspection, but there would be even less turning in due to defects if there was a pit for the purpose.

Mr. Smith, of Schenectady, asked what the inspector actually does on the car between trips. Mr. Carver replied that the principal duties of the inspector were brought out in the last sentence of the paper. It is better to keep out of trouble than it is to explain how you got into it. When the crew of a car makes a report on some trouble, it is up to the inspector at the end of the road to fix it if he can. That trouble may be one or more of a hundred things. If there was no inspector at the end of the line, the car would have to be turned in, although it may be only a broken trolley wheel, a bent controller finger, brakes out of adjustment, or similar things. If the inspector were to inspect every other car—say eight to sixteen minutes between cars—he could do better, but for the purpose of this experiment the company has given the inspector six to eight minutes between every

car. The paper gives only the differences in percentage. From that line (St. Paul-South) the percentage of cripples to operating cars in October, 1905, was 4 per cent; in November, 8 per cent; in December, 11.5 per cent. On Jan. 1 the Rochester company started this trip inspection system. The percentages of crippled cars dropped from 11.5 to 1.53 in one month. It was .43 per cent in February, 1.18 per cent in March, .38 per cent in April, and .80 per cent in May. Comparing this line with the others, it was found that the percentage of the latter for May was 5.89, as against the .80 given above. The St. Paul-South line on which the experiment is being tried is the best fitted for this inspection. In fact, the company could not inspect on other lines to advantage because they are not built for it. The company only tried it on this line to see what the results would be.

President Danforth said it should be borne in mind that on that line last winter the company was operating thirty-five full converted summer cars, each having an equipment of four GE-800 motors which would naturally require careful watching. As Mr. Carver had said, a large part of the pull-ins are due to brakes out of adjustment. This would naturally arise from the fact that the cars are not always carefully inspected at night because the men in the car house know that the inspector on the line would catch the cars the first trip in the morning. This system has proven so successful in Cleveland that it seems worth trying here. The speaker would suggest to railways having long lines where the motor equipments are subjected to heavy service that it is worth a trial at least. On this particular line, in making a change of cars, for instance, due to a defect, the car had to be run off the line 1½ miles to the car house, so that the cost of the crew making the shift is an important item. A company would not have to pull in many cars a day to pay the cost of inspection at the end of the line. Mr. Carver brought up the question of cleaning cars in a special washroom as against any place in the station. The speaker understood that a large part of the Buffalo work is being done in a special room, and wanted information on this point. Mr. Hanf, of Buffalo, explained that one section of the car house is used as a wash room. When cars are pulled in off the line they come in over the pits, where they are thoroughly inspected, and are then moved up into a washroom where they are cleaned and then run out ready for service. President Danforth said it was a comfortable arrangement to have a sufficient number of cars so that a car in regular service to-day can be used as a tripper to-morrow. Many companies are not so fortunately situated, and are obliged to clean cars at night. Those who have inadequate car-house facilities and means of regulating the temperature in winter find it difficult to keep the cars in shape. His company has been discussing the advisability of remodeling its car houses and providing a separate wash room as in Buffalo. That means the expense of car shifting. It is a question whether the cost of shifting would not offset the additional cost of cleaning a car whenever it happens to land in the car house, that is, considering the cleaning of the car body only.

Mr. Stanley, of the Public Service Corporation, said this matter of cleaning cars is a very vital one to railways. It is one that must be solved in some way. The public to-day will not tolerate uncleanly cars, nor frequent interruptions to service on account of crippled cars. Primarily this is a question of investment as to the amount of care taken of the equipment. When the present management took hold of the Publice Service system there were, properly speaking, no car houses at all. The company used old horse-car stables and open lots. Owing to other more pressing matters requiring investment, the company has for cleaning cars simply built a small place capable of taking care of two cars at a time. The room is heated by hot water, and the cars are run in and washed thoroughly. It is not a very satisfactory method, as it is slow and cumbersome, but it is the best under the circumstances. It is not altogether a question of cleaning the outside of a car, but also the inside. The speaker asked if any one present had had experience with the vacuum process of cleaning cars.

Mr. Cole, of Elmira, said his company had been cleaning cars with compressed air, but since experimenting with the vacuum process it had decided to change over to the latter system. It is not necessary to have any special car house, because the dirt is all taken up and deposited in a can. With compressed air the dirt is blown off the floor to the ceiling and from the ceiling to the floor, most of the dust remaining in the car. With the vacuum system a man can go through a car more quickly than with a broom, and accomplish better work. He can get the dirt from the ventilators, back of the heaters and other places which could not be cleaned by other means, and can do this effectively and efficiently in from ten to twelve minutes. There is one other condition in conjunction with the inspection of cars which comes up in accidents. The speaker has acted as expert witness in many cases, and nine times out of ten the case comes down in the cross-examination to the condition of the car at the time of the accident —for instance, there may have been a loose bolt on the running board or there may have been something wrong with the grab handle. A number of men from the shop will be called, but they are generally poor witnesses. Immediately, in case of an accident, the car should be examined by an experienced inspector of that division who is a good witness and who can afterward go on the stand and testify regarding the actual condition of the car right through. This should be part of the inspector's duties, and he should be trained in it.

Mr. Harvie, of Utica, speaking of car cleaning, said he had recently installed a system which combines compressed air and vacuum methods, but there is one thing the system does not seem able to do. It will not pick up paper, peanut shells and the like. The speaker wanted to know what will pick up these larger pieces.

President Danforth replied that the best thing is the old-fashioned broom and a faithful servant. Mr. Cole's suggestion that an inspector on every division who had sufficient experience to make a proper examination of a car after an accident, act later as a first-class witness, is a good one, but the speaker had not in a long time found a car-house man who made a good witness. The only thing left to do is to have the cars in good condition all the time by following up closely the car inspection work before the accident happens. One good point about car inspection at the end of the line is that evidence can be produced to show that at the end of every trip the car is looked over, and if anything is the matter the car does not go back into service until repaired. The motorman is not obliged to run a car for a half a day or so until some crew comes around with a relief car.

Mr. Fassett, of Albany, spoke of his method in accidents, which is to have the car inspected by a car-house foreman who makes a written report which forms part of the papers of the accident case. As the foreman is able to refresh his memory from his written testimony, he makes a better witness on the stand.

Mr. Carver, of Rochester, thought perhaps some of the gentlemen present who were running interurbans might be interested in the experience he had had with the Rochester-Sodus Bay line, which in certain sections is rough and hilly. The cars on this line weigh from 17 to 18 tons without pas-

sengers, and are equipped with four GE-67 motors. The company has instituted a limited service for three summers back, making the round trip of 77 miles in three hours and forty minutes, including thirty-two regular stops on the run. The average speed, including these stops, is 23 miles an hour with a 19 pinion and 65 gear. To this line the company has applied trip inspection, and for the last three months not one car has been laid up for electrical or mechanical troubles.

A delegate asked whether trip inspection was considered by Mr. Carver a better method of inspection than the practice of overhauling a car thoroughly after running a fixed mileage, or whether trip inspection is also necessary in addition to the mileage overhauling. Mr. Carver replied that the car should be overhauled regularly and thoroughly in addition to the trip inspection. There is no change in the general method of overhauling. The 65 cents extra daily charge mentioned in the author's previous paper, due to trip inspection, must be figured as the cost of increased reliability in operation. This supplementary paper was written to vindicate that expensive 65 cents a day by showing the decrease in the percentage of cripples brought about by trip inspection.

Mr. Harvie, of Utica, asked why it would not be possible to figure out the most economical mileage on which cars should be regularly overhauled, and thus simplify the inspection proposition.

Mr. Carver thought that theoretically that is all right, but it does not work out in practice.

President Danforth remarked that sight must not be lost of the fact that this trip inspection at the end of the line includes sweeping, cleaning windows, etc. Those matters cannot be left to be done every third day or so. Aside from the cleaning mentioned commutators and controllers are examined and other parts of the electrical and mechanical apparatus looked after.

Mr. Pardee, of Canandaigua, said his old system of cleaning interurban cars was very unsatisfactory, but he has adopted a system of oil cleaning which, though somewhat more expensive, gives absolutely clean cars. The car house is in the middle of the line, but at the Geneva terminal the company has a small pit where cars lay over forty minutes. An inspector and a car cleaner are stationed at this point. The inspector makes repairs such as putting on brake shoes, replacing broken wheels, tightening loose bolts, and seeing generally that all parts are in perfect condition; the conductor sweeps out the car and tests all overhead fittings; the motorman goes over his controller and other electrical apparatus; and the cleaner wipes the outside of the car, polishes metal parts and replaces the cuspidors with a clean set. While the other car is coming in the cleaner cleans the removed cuspidors, which are then ready to replace those on the next car. Formerly there were some complaints from passengers on cars that had been out for seven or eight hours, to the effect that the smoking compartment was filthy, but that complaint has now been eliminated. It is found that the inspection at the end of the line does away with many serious repairs that would otherwise be necessary. This is particularly true of cars in high-speed service, for even a loose bolt caught at the end of a trip may save a whole lot of trouble.

President Danforth asked Mr. Pardee if the two men maintained at Geneva replace men who otherwise would be required in the main car house. Mr. Pardee said yes, to some extent. This method is costing them a little more, but they get clean cars where they did not get them before. The extra expense amounts to about the time of one car cleaner at Geneva, but this is not a serious matter considering the results.

President Danforth then asked for expressions of opinion regarding the advisability of issuing interchangeable coupon tickets for use on interurban lines in accordance with the suggestions made by Mr. Pardee, chairman of the committee on interchangeable coupon books. Mr. Peck, of Schenectady, said he was in favor of the general scheme, and was prepared to recommend his company to use the books.

Mr. Wilson, of Buffalo, said he had noticed on a very cursory examination of the report that it provides for a reduced rate, and that the coupons are to be accepted at the ticket rate. At that rate his company would be making a reduction below its present lowest rate.

Mr. Pardee explained that the clause in relation to this reads as follows: "The conductor will detach, in the presence of the passenger, a sufficient number of coupons at their face value to cover the local cash fare on his train, or the local one-way ticket fare if same is lower than local cash fare." This clause was put in to meet the condition where the cash fare is more than the ticket fare. On his own road the one-way tickets are 1½ cents a mile, while the cash fare is 2 cents.

President Danforth said if it seems necessary, of course, the regulations can be amended to suit Mr. Wilson's or any other company's conditions. The intention is to sell one-way tickets in bulk, such tickets being good on any road for any distance by tearing out the coupons necessary to make up the fare. Special rules might be placed on the cover of the book to cover the use of the tickets on particular lines. There is no reason why a general rule should be made to cover all cases. It could be specified, for instance, that the coupons should be used in a certain manner on the International Railway. These coupon books have been found of immense advantage in the Middle West, and have enabled the interurbans to take a great deal of business away from the steam railroads. They have also attracted the drummer trade, a class of riders very profitable to interurban roads. Anything that can be done to encourage travel on electric lines ought to be carefully considered. It seemed to the speaker that, inasmuch as this system had been thoroughly tried out and found to work satisfactorily in Ohio, Indiana and Michigan, that the New York companies are not taking very great chances in trying it in this State.

It was then moved that the committee be continued and that each company now having a copy of the proposed contract go over it carefully and advise the committee of the results of the examination, either pointing out difficulties or advising the committee that this form of contract is satisfactory to them, and that the committee prepare a contract covering all cases and send it to the members for signature. The motion was seconded and carried.

President Danforth then brought up the subject of T-rails in city streets. Last winter, at the instigation of a village of New York State, an attempt was made to prohibit the use of T-rails on the public streets. There is some agitation now about this prohibiting interurbans desiring to lay track to use T-rail in cities and villages. This is due really to the prejudice against the old center-bearing T-rail and to some of the abominable track work done in the past with T-rails. No one would uphold the use of any kind of rails on the street which are dangerous to vehicles. The association and its individual members should make the public acquainted with the fact that with proper T-rail construction it is possible to maintain a better-looking street and a safer road for vehicles. This T-rail construction is not an experiment. It has been thoroughly demonstrated in the West in some very large cities that a Shanghai T-rail laid in the street with the pavement properly laid presents less obstruction to vehicles than any of the grooved rails. Many will doubt this unless they have seen it, but the wagon tires do not remain in a groove

and the wheels may be turned easily in and out, which is not true of grooved rails of the ordinary girder type. One of the companies in this State has been discussing this question with the city authorities for months, and the company turned to the Middle West for assistance in backing up its arguments in favor of T-rail in brick-paved streets. It has been found in Minneapolis, St. Paul, Milwaukee, Indianapolis and other large cities using T-rails, that this construction gives easier riding for both cars or carriages. The speaker suggested that in discussing this subject with the local authorities the members take pains to explain that the T-rail, like any other, can be an obstruction if the pavement is not properly maintained. In New York State the cost of maintaining the pavement is generally borne by the railway. The responsibility for seeing that it is kept in condition lies with the municipal officers, but it costs the taxpayer nothing.

Mr. French, of Utica, said on their system they are planning to lay a 7-in., 91-lb. Pennsylvania T-rail on Genesee street, the principal thoroughfare, and one therefore carrying heavy traffic. The company had this privilege because the original franchise was granted by a village outside the city, and the company has the right to lay T-rail under this old franchise. The tracks are to be laid in concrete with tie-rods, and the Arthur hump-block is to be used. There is no objection to this construction as compared with girder rail. The company also expects to lay in the village of Hartford an 80-lb. T-rail, concreting the track this year and paving next year.

At this point C. R. Barnes, engineer of the New York State Railroad Commission, entered the convention hall and was invited to address the meeting.

ADDRESS BY MR. BARNES

"I do not know of anything that I could present to you that would be new to you. You gentlemen are paying such close attention to details of construction, maintenance and operation that my position after a while will be a sinecure. There is, however, one matter in reference to which we have received numerous complaints; that is with reference to the height of car steps. These complaints have been referred to me during the past year, and I have reported to the commission that in my judgment it was a matter which no doubt would receive the attention of the Street Railway Association of the State of New York, and that it was a better way to tell them than to report or act upon individual complaints. That course has been pursued by the commission. I suggested to them that I would bring the matter to the attention of the State convention. I think the action by your body would be in the line of benefit to the members of the association and convenience to the public. A step 17 ins. or 19 ins. high is really too high for old and infirm people. It adds to their discomfort and your accident account. I would like to see some action taken by your convention proposing the appointment of a committee to consider the matter and bring about, if possible, some uniformity in that direction. Gentlemen, I thank you again for your kind invitation to address you and the pleasure I have had in attending this convention." (Applause.)

In line with the suggestion made by Mr. Barnes, a motion was made and carried that the president appoint a committee of three to study and report on the proper height of steps for local and interurban cars, and present its report at the next quarterly meeting.

The report of the nominating committee was then received, and the following officers were unanimously elected for the ensuing year. President, J. N. Shannahan, of Gloversville; first vice-president, T. W. Wilson, of Buffalo; second vice-president, E. S. Fassett, of Albany; treasurer, H. M. Beardsley, of Elmira; secretary, C. B. Fairchild, Jr., of New York City; executive committee, the officers and Oren Root, Jr., of New York City; W. H. Pouch, of Newburg; C. D. Beebe, of Syracuse, and C. Gordon Reel, of Kingston.

Before adjournment Mr. Allen, of Utica, called attention to the fact that B. B. Nostrand, Jr., who had been a member of the executive committee since 1902, was retiring from active business for a period of rest. Mr. Allen spoke feelingly of the regard and esteem in which Mr. Nostrand was held by his associates on the executive committee and by all the members of the association, and moved that there be spread upon the minutes a resolution properly acknowledging these sentiments. The motion was carried by a rising vote, and the president appointed a committee, consisting of Messrs. Allen, Wilson and Root, to draft suitable resolutions. Mr. Nostrand in a few fitting remarks expressed his deep satisfaction and appreciation of the action taken by the convention, and said, although he was severing his connection with the active work of the association, he would esteem it a privilege to show his interest in that work by becoming an associate member.

The convention then adjourned.

CLEVELAND'S THREE-CENT FARE COMPANY

Interest is evidenced in Cleveland over the prospectus and financing plan of the Forest City Railway Company, the so-called three-cent-fare company. The authorized capitalization is $2,000,000 6 per cent cumulative stock, of which $750,000 is to be sold immediately for lines in contemplation. The stock is offered to the public at 90. The property has been leased to the Municipal Traction Company and, according to the prospectus, no bonds or preferred stock can be issued. It states that the company has a twenty-year franchise for 13 miles of double track, including two miles of free territory in the heart of the city. Under the terms of the lease the Municipal Company guarantees stockholders of the Forest City Company 6 per cent on the cumulative stock. The Municipal Company is required to devote all surplus earnings, above operating expenses and dividends, to the extension of the service or acquiring the stock of the Forest City Company. Appended to the prospectus is a statement of A. B. Dupont, who is to manage the new company. He says that the cost of construction of 13.6 miles at $50,000 a mile, including overhead equipment and power, will be $680,000, and that the wards traversed by the proposed lines have a population of 124,506, which at the same rate of earnings per capita shown by the Cleveland Electric would earn $1,342,175. Assuming no increase in business, and dividing the earnings with the other company on a mileage basis, the earnings of the Forest City Company would be $384,000 a year. It is assumed that if the Cleveland Electric meets the competition it would cost the Forest City 25 per cent of its earnings, reducing them to $288,000. Figuring operating expenses at 70 per cent, which would leave 30 per cent for net earnings, the profits would be $86,400, or 11½ per cent on $750,000, the cost of the road.

Cleveland financial people find many weak points in the new company's argument. The company compares its earnings with those of the Cleveland Electric, yet under the terms of its franchise it can receive only 3 cents per passenger, while the Cleveland Electric has been getting something like 4½ cents. In the matter of extensions and betterments, the new company will have to pay 6 per cent on its stock, while other companies are obtaining new money by the sale of new bonds at 5 per cent and in many cases 4½ per cent.

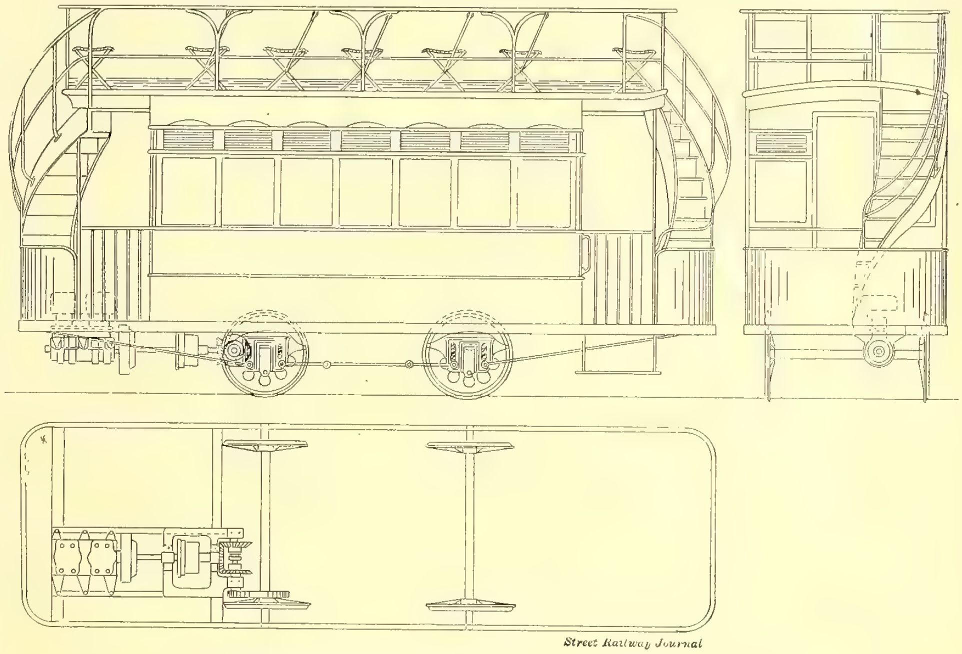
Students of the Cleveland situation believe that the company cannot earn its operating expenses and allow for depreciation, let alone paying 6 per cent dividend. The situation has been analyzed by a well-known traction expert in this way: The first ten miles of the new company's track, which it is stated will be placed in operation in the near future, will cost $500,000, according to the figures. Interest on this at 6 per cent is $30,000. At 3 cents per passenger it will take 1,000,000 passengers to pay the increased charges, or 2740 passengers a day. If cars are operated on five-minute headway, or twice as often as outlined in the prospectus, for eighteen hours a day, this make 24 trips per hour, or 432 trips per day. Thus the line must carry 6 1-3 passengers per trip to pay the interest charges. Figuring the depreciation at another 6 per cent, it means 12 2-3 fares to pay interest and depreciation. The 432 trips per day make a total of 2160 car-miles per day, and at 13 cents per car-mile, the operating expenses for the line will be $280.80 per day, and to raise this sum at 3 cents per passenger requires 9630 passengers, or 21¾ passengers per trip, to pay operating expenses. Adding to this the passengers necessary to pay for interest and depreciation gives a total of 34 1-3 fares to be collected on each trip to pay operating expenses, depreciations and interest. Four hundred and thirty-two trips per day with an average of 34 paying passengers means a total of 14,688 passengers per day, or 5,361,120 passengers per year, necessary to be carried on ten miles of single track.

Comparing these figures with the business of the old company: The entire system of 250 miles of single track carries about 100,000,000 passengers per year, or about 400,000 per mile of track. Thus on the average ten miles of track the Cleveland Electric carries 4,000,000 passengers per year, whereas, as shown, the new company with 3-cent fare must carry 5,361.120 passengers per year to pay expenses, depreciation and interest.

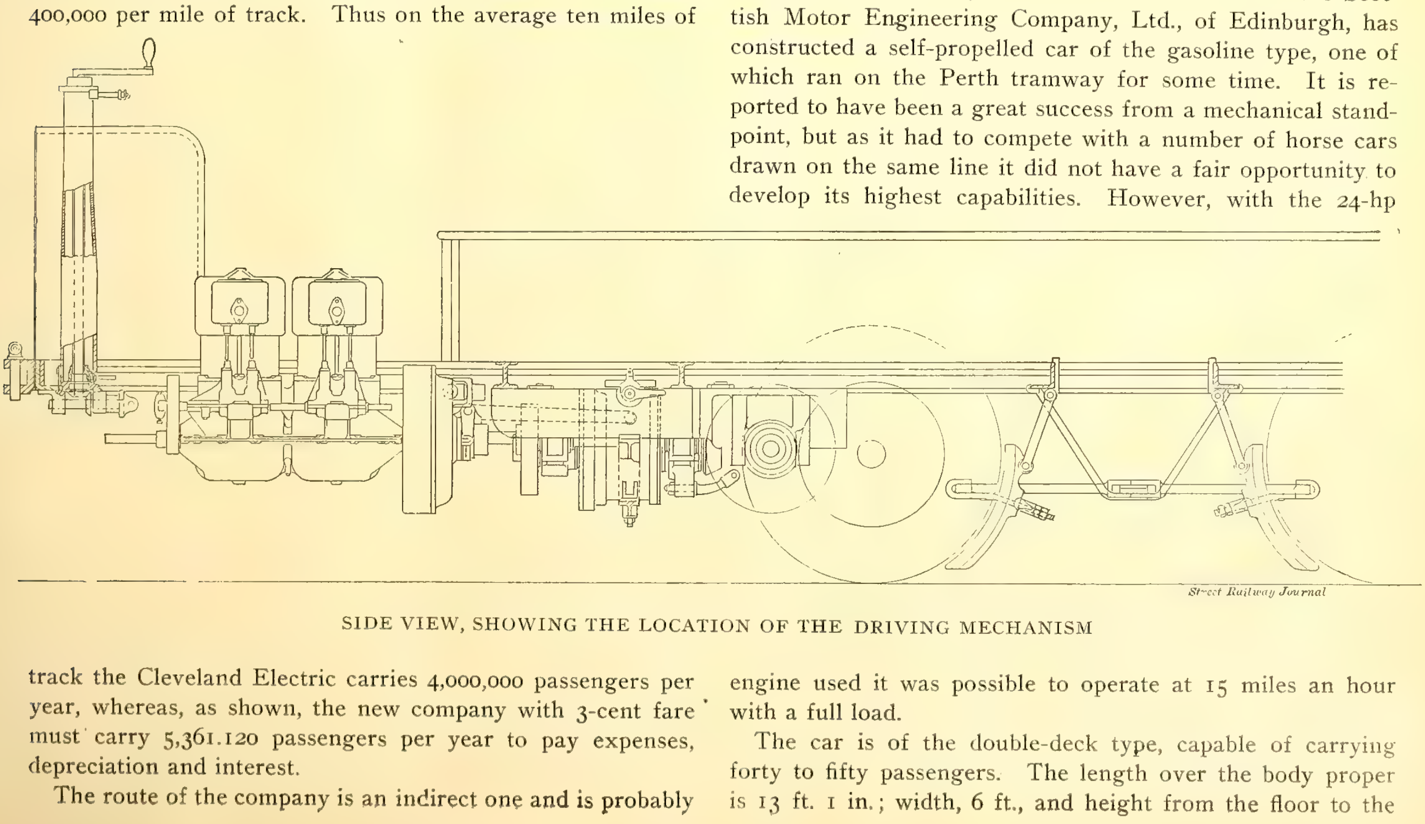
The route of the company is an indirect one and is probably not up to the average of the Cleveland Electric system as regards population; hence it is believed by the majority of conservative Cleveland people that the new line has little chance of earning enough to pay its interest charges.

A GASOLINE STREET CAR

In view of the present activity in developing gasoline cars for interurban work, it is not surprising to learn that like efforts are being made in the street railway field. Outside of the United States and Canada there are still a large number of horse tramways, notably in the Southern hemisphere, which would like to use mechanical power, but cannot afford the cost of electrification. To meet this condition the Scottish Motor Engineering Company, Ltd., of Edinburgh, has constructed a self-propelled car of the gasoline type, one of which ran on the Perth tramway for some time. It is reported to have been a great success from a mechanical standpoint, but as it had to compete with a number of horse cars drawn on the same line it did not have a fair opportunity to develop its highest capabilities. However, with the 24-hp engine used it was possible to operate at 15 miles an hour with a full load.



ELEVATIONS AND PLAN OF GASOLINE STREET CAR



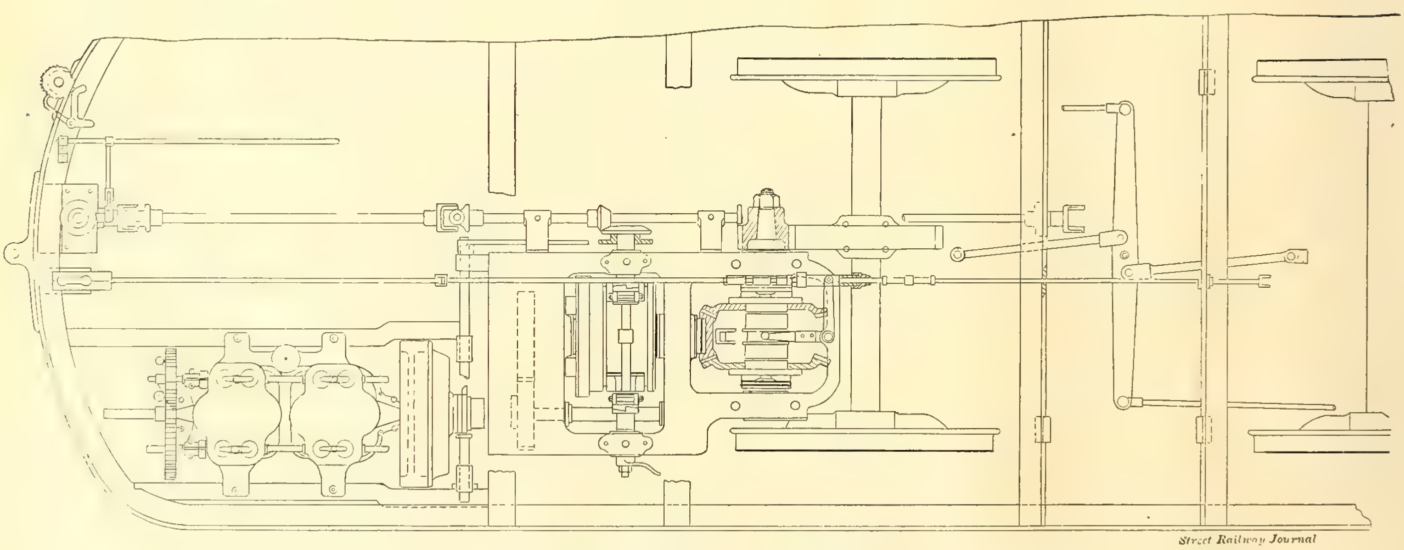
SIDE VIEW, SHOWING THE LOCATION OF THE DRIVING MECHANISM

The car is of the double-deck type, capable of carrying forty to fifty passengers. The length over the body proper is 13 ft. 1 in.; width, 6 ft., and height from the floor to the

center of the roof, 6 ft. 8 ins. The platforms are each 5 ft. long. The weight of the empty car is from four to five tons, and it is capable of ascending a grade of 1 in 15 with full load. The motive power consists of a 24-hp to 30-hp four-cylinder engine mounted on a steel frame and firmly held in position by the bed-plate. The power is transmitted by means of a large diameter friction clutch, thence through a special compound starting gear and suitable gearing to the axles, no chains being employed. This gearing is fitted into a strong cast-iron frame, which is also secured to the steel framing and linable to the motor, the steel frame being bolted to the ends and sides of the car.

It will be seen from the accompanying drawings that the operating machinery for the car is so simple in construction that it can be manipulated by a novice or ordinary tram driver. The manufacturer simply fits a four-cylinder engine of 24 hp of the ordinary type as would be fitted to an automobile, but not running at so great a speed, with a direct drive from the flywheel instead of by cone clutch to the gear box. The gear box is merely a drum held up with a pair of shoes drawn tight with a lever from the front of the car. Pulling this lever over tightens the shoes on the drum and holds it so as to allow the internal gear to work and act as a driver, and by pulling it further over it brings in a second action and releases the shoes and allows the gear to drive direct from the engine. This is for forward motion. In stopping the drum it is only necessary to switch the lever back and the whole is disconnected.

To drive the car backward the driver disconnects his handle and takes it to the other end of the vehicle, and performs the same operation over again by a lever running on the then forward end of the car. As will be seen on the plan, from the gear box to the drive of the wheels spur pinions are used, one wheel being in mesh with the pinion from one end of the car and the second one from the reverse end of the car which forms the reverse drive.

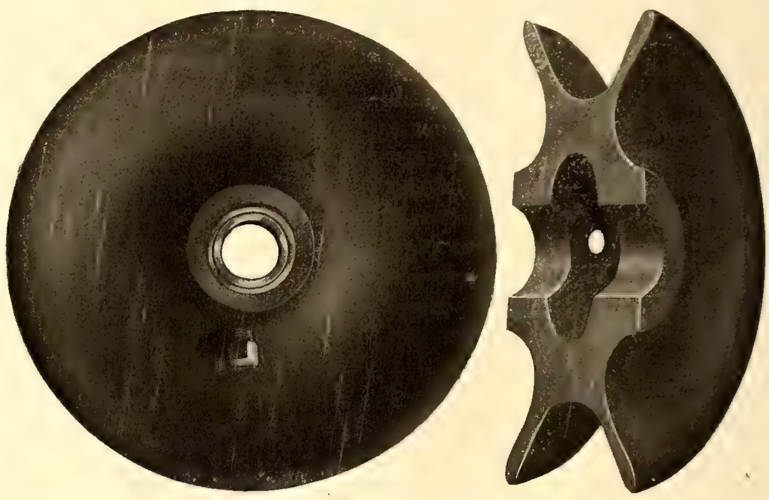


LAYOUT OF GASOLINE APPERATUS, BRAKE CONNECTIONS AND OTHER OPERATING DETAILS

The consumption of fuel, with full load of passengers, is on an average for a day's run, say 70 to 100 miles, about one gallon for 8 to 9 miles, with a gradient of not more than 1 to 8. The general running costs of a vehicle of this description, including motorman and conductor, fuel consumption, lubricating oil, storage, cleaning, and general running repairs, would be approximately 18 cents per mile.

AN INTERESTING TROLLEY WHEEL

A trolley wheel said to be distinct from any other in use is being made by the Keystone Steel Company, of Sebring, Ohio, its unusual feature being that it is composed of a metallic and chemical alloy whose base is iron. The formula is a secret with this company, and it is claimed that it imparts to the metal a magnetic quality which renders it equal to copper as a conductor of electricity. It is claimed that the metal is possessed of a smoothness and uniformity of grain which eliminates arcing and a consequent wasting of current, and undesirable heating of the wheel and wire. It is said that the wheel is but a trifle harder than the ordinary brass wheel, and



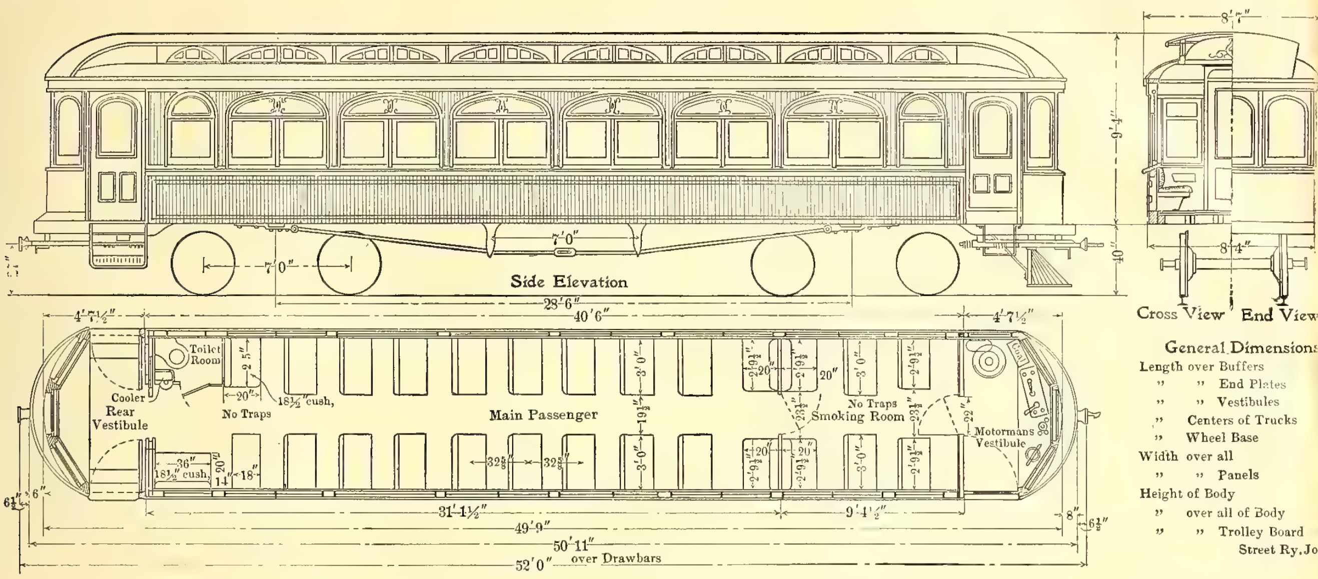
SIDE VIEW AND SECTION OF TROLLEY WHEEL

that there is no excessive wear on the trolley wire. It is cast solid without spokes, which renders possible the use of a larger oil reservoir than an ordinary brass wheel, and the statement is made that it will require only about one-fourth as much lubrication as the ordinary wheel. The wearing surface is thicker than in the brass wheel, to give increased life. Ordinary graphite bushings with standard axles are used.

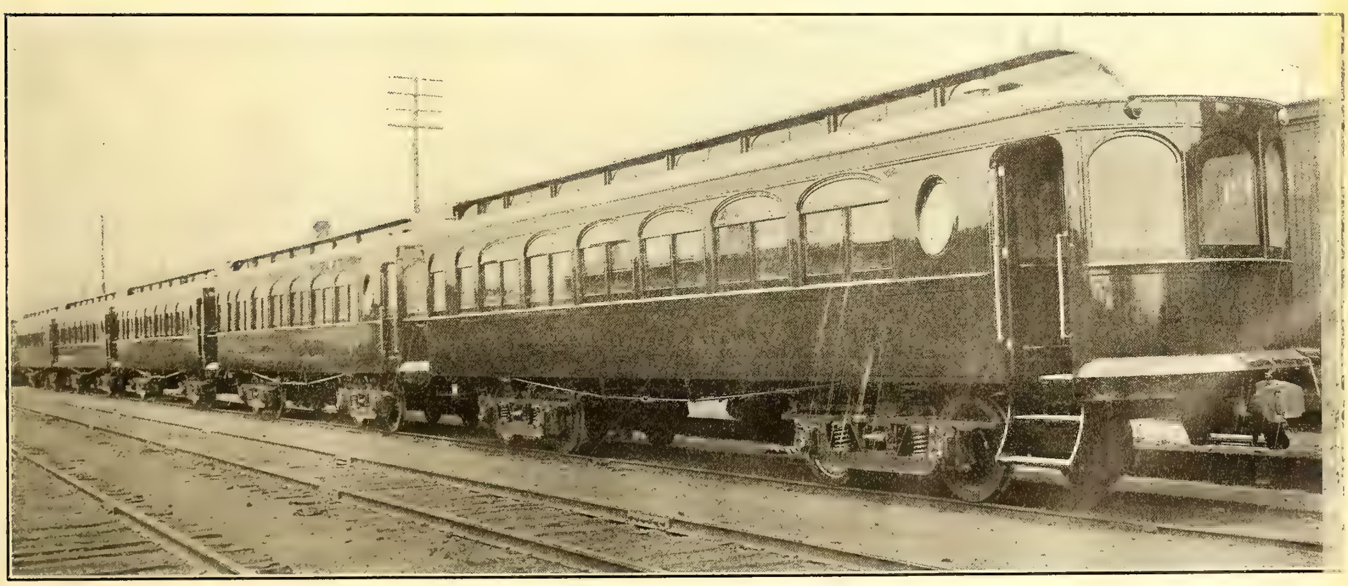
The Stark Electric Railway of Alliance, Ohio, has been using these wheels with satisfactory results for the past eight months, and now has all its cars equipped with them and uses them exclusively. General Mowrey, of this company, states that the wheels are averaging 4000 miles under severe service, and that so far as he can see they answer all the requirements.

NEW LIMITED SERVICE FOR LAKE SHORE ELECTRIC

The Lake Shore Electric Railway has experienced such a tremendous growth in its limited business from Cleveland to Toledo that it has not only increased the number of trains from three to five a day each way, but since June 15 it has operated the cars in trains. This was made possible by the recent delivery of five very fine cars built by the Niles Car & Manufacturing Company, which are especially designed for train operation. The half-tone illustration herewith shows five of the cars as recently delivered to the company on their own wheels. Five more of these cars will be delivered by the same manufacturer within the next thirty days.



ELEVATION, END VIEW AND PLAN OF LIMITED SERVICE CAR FOR THE LAKE SHORE ELECTRIC RAILWAY


A TRAIN OF CARS ON THE LAKE SHORE ELECTRIC RAILWAY

The cars are 52 ft. over all, 40 ft. over corner-posts, and 8 ft. 7 ins. extreme width. The other important dimensions are shown on the accompanying drawing. In order to give extreme seating capacity, the baggage compartment was eliminated in the new car, but it is probable that they will be run in trains with some of the present equipment which have baggage compartments. The cars have Pullman shaped windows, with gothic and deck sash glazed with cathedral art glass. The interior finish is of cherry, the main panels having borders inlaid with white holly, the ceiling of semi-empire type. The seats are Hale & Kilburn high head roll upholstered in leather. The toilet rooms are finished with white tile. The cars are fitted with Van Dorn draw-bars and couplers, enabling them to take a 35-ft. radius curve in trains. They have Nichols-Lintern air sanders, and are heated with Radiant hot-water heaters. They are mounted on Baldwin Locomotive Company's high-speed interurban M. C. B. trucks, fitted with Standard forged and rolled steel wheels 37½ ins. in diameter. The axles are 6 ins. diameter, and the gears are solid 5½-in. face. Each car is fitted with four Westinghouse No. 121 motors developing 85 hp, and is controlled by the Type M automatic feed, and they have Westinghouse train-control air brakes and Peacock emergency brakes. An interesting feature is the use of the Lintern Car Signal Company's system of classification and marker lamps on both ends. These are operated in connection with a storage battery which is also connected to two circuits of lamps in the cars, thus holding up the illumination when the trolley is off.

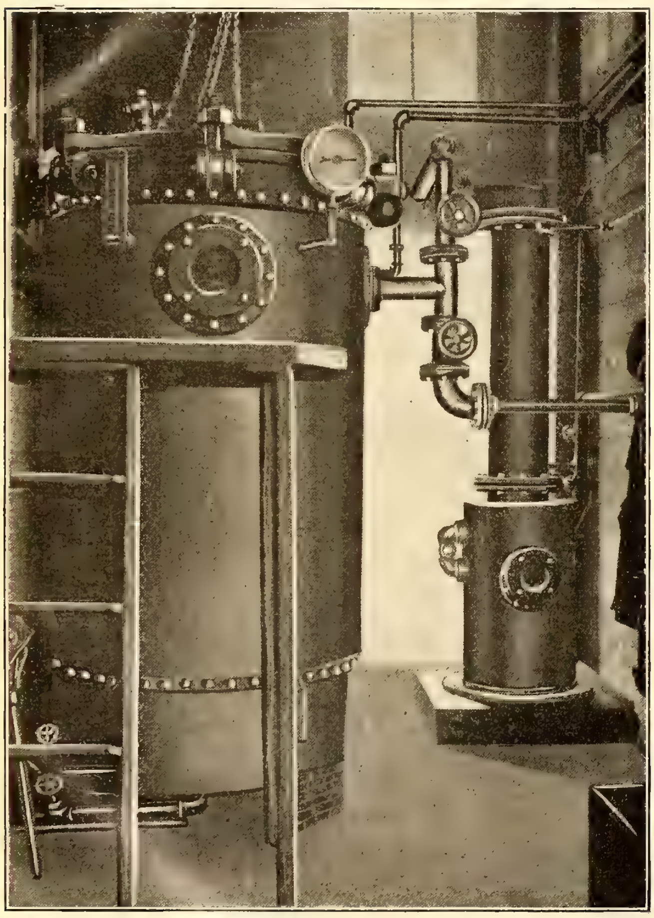
The train operation was tested out last week by General Manager F. J. Stout, representatives of the Westinghouse and General Electric Companies, and officials of the road. The train reached a maximum speed of 71 m. p. h. for

several miles, and it is believed that it will be possible to reduce the through schedule between Cleveland and Toledo to four hours without difficulty.

IMPREGNATING FIELD AND ARMATURE WINDINGS

The scheme of impregnating coils by means of a vacuum process, which has been adopted by several of the large electrical machinery manufacturers, is now being taken up by the manufacturers of repair parts.

The Dittrick & Jordan Company, of Cleveland, has recently installed an up-to-date outfit built by J. P. Devine Co., of Buffalo, operating under the Passburg patents. The outfit consists of two wrought-iron, air-tight tanks, one of them the vacuum chamber and the other the liquid tank. The coils are placed in the vacuum chamber, the field coils being piled on a table, and the armature coils suspended from hooks. A combined vacuum and air pump exhausts the air from the vacuum tank, drawing with it all moisture contained in the air and in the materials used in the makeup of the coils. The moisture passes through a condenser and is drained off in the form of water. After the air is exhausted, the action of the pump is reversed and air is forced into the liquid tank at a high pressure, thus forcing the compound into the vacuum chamber and impregnating all parts of the coils. The vacuum tank has an observation glass, so that the amount of compound in the chamber can be seen. There is a thermometer showing the temperature of the compound, and a double-action gage showing the vacuum and the air pressure.



VACUUM IMPREGNATING OUTFIT IN SHOPS OF DITTRICK & JORDAN COMPANY

The coils are kept under vacuum pressure for a period of two hours or more, according to the winding of the coil, and under air pressure for a period of one hour or more. The air pressure is then reduced to a low pressure, the valve between the tanks is opened, and the compound is forced back to the liquid tank. The valve is then closed and the coils are left in the vacuum tank for half an hour to drip.

The outfit differs from similar outfits in that the two tanks have circular coils around the interior, in which live steam is circulated, thereby keeping a uniform temperature throughout.

The Dittrick & Jordan Company is using a solid compound having a melting point of from 280 to 300 degrees, and it is claimed that this is the only type of apparatus that will use the solid compound. The advantage claimed for the solid compound is that it requires a much higher degree of heat to melt it and there is less liability of the insulation running through the overheating of a motor while in use. It is claimed that coils made by this process will give two or three times the life of coils made by the old dipped process. As the coils are rendered practically solid, there is no chance for the slipping of wires, and the fact that the air and moisture are removed gives the best condition for the radiation of heat.

In the future the Dittrick & Jordan Company will follow the plan of cutting open one coil out of each lot as it goes through the process in order to insure that the impregnation is perfect. The fact that the impregnating compound enters the vacuum chamber without breaking the vacuum eliminates, it is claimed, any possibility of the dried coils absorbing moisture, as was the case in the old method of drying and impregnating in bake ovens and dip tanks.

The new outfit was tested recently and about twenty prominent city and interurban men from Cleveland and vicinity were present at the demonstration, and were entertained by the Dittrick & Jordan Company .

WESTINGHOUSE NO. 119 RAILWAY MOTOR

The Westinghouse Electric & Manufacturing Company has recently brought out a new direct-current motor, under the trade name of No. 119. This motor has a normal rating, under the normal conditions, of 125 hp at 550 volts. With stops every 1½ to 2 miles, a double No. 119 equipment has sufficient capacity for the operation of a car measuring 40 ft. to 50 ft. over all and weighing approximately 40,000 lbs., without equipment or load, over a level track at a schedule speed of about 30 to 32 m. p. h., and should develop a maximum speed of 43 m. p. h. Under similar conditions a corresponding four-motor equipment should easily maintain a schedule speed of 32 to 36 m. p. h. with a car weighing approximately 50,000 lbs., without equipment or load, and should develop a maximum running speed of 50 m. p. h. These conditions are based on a gear reduction of 24-in. to 51-in. and 33-in. wheels.

The frame is of cast steel in two parts, split at an angle of 45 deg. with the horizontal, and is so supported on the axle that most of the weight is borne by the solid casting and not by bolts. A large opening in the frame over the commutator, extending well down over the axle, provides easy access to the brushes and brush holders, and makes inspection possible from a pit. The clearance between armature and field coils may be inspected from a hole in the rear end bell and an opening under the commutator. Nose suspension with safety lugs is employed.

The bearing for the armature shaft at the commutator end is 3¾ ins. x 7 ins., and at the pinion end is 4 ins. x 10 ins. The axle bearings are 11¾ ins. long and may be made for any shaft diameter not exceeding 6 ins. The caps are split at an angle of 35 deg. with the perpendicular, so that the weight of the motor is carried almost entirely by the portions of the frame which extend over the axle, and the cap bolts are re-

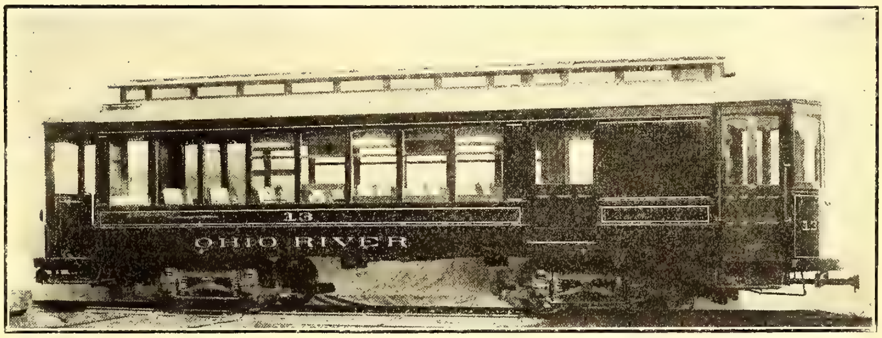
lieved of heavy strains. Oil and waste lubrication is provided for all bearings. The complete armature is 17 ins. in diameter. The total air gap between armature and poles is 7-16 in.

The commutator has 185 bars. It measures 14½ ins. in diameter, is 6 23-32 ins. in length, and provides a wearing depth of approximately one inch. The brush holders carry three ½-in. x 2-in. carbons. Gear ratios of from 17:58 to 24:51 may be employed.

The weights of the No. 119 motor are approximately as follows: Armature alone, 1340 lbs.; motor alone, 4175 lbs.; motor complete with gears and gear case, 4600 lbs.; double equipment with motors, two controllers and electrical details, 10,900 lbs.; quadruple equipment with motors, two controllers and electrical details, 21,080 lbs.

THE OHIO RIVER ELECTRIC RAILWAY SYSTEM AND ITS NEW EQUIPMENT

The Ohio River Electric Railway and Power Company operates 12 miles of street railway, extending from Middleport, through Pomeroy, Minersville and Syracuse to Racine, Ohio, paralleling the banks of the Ohio River with the towns of Clifton, Mason, Hartford, New Haven and Graham, W. Va., on the opposite side; serving a direct population of 16,000, with a contiguous territory of 10,000 additional. A unique feature of these towns is that the various corporation lines almost join one another, making it practically one little city the entire distance. The line occupies the well-known Pomeroy Bend, situated in the heart of the beautiful Ohio valley, bordered by precipitous cliffs on one side of the river and sloping hills on the other, presenting a panorama of scenic beauty rarely surpassed. The half-tone strikingly illustrates the natural beauties of Pomeroy. The city is in the center of one of the largest salt, bromine and calcium producing districts in America; along the lines of the street railway company are extensive coal mining properties, tapping the largest undeveloped body of bituminous coal in the State of Ohio. The road was built in 1900, since which time its business has steadily increased; it has been a potent factor in advancing the commercial interests of the community it serves, and has produced in that section an era of prosperity previously unknown. Much attention has been devoted to the development of carload freight business, which has proved to be a very profitable source of revenue. Last year 1934 carloads were moved on its lines by a 17-ton electric locomotive with a draw-bar pull of 4000 lbs., from or to the Hocking Valley Railway Company. In addition there is much local and way freight carried to and from all points on the line. This branch of the business offers almost unlimited possibilities, and its present growth is confined only to the limit of car service obtainable. An electric locomotive is shown in one of the illustrations, pulling a train of cars out of one of the industrial sidings. A five-car passenger schedule is operated with a twenty-minute service between Middleport, Pomeroy and Minersville, through cars running to Syracuse and Racine every hour. In 1905, 911,971 passengers were carried, and if the present ratio of increase is maintained the number of passengers carried this year will far exceed one million. The power house is located in Pomeroy near the mouth of a coal mine, giving the advantage of very cheap fuel. All machinery is built in duplicate. A 500-volt d. c. system is employed, with ample feeders extending in either direction. The company also does all the municipal and commercial lighting in Pomeroy, which is operated by an a. c. system from the same power house.



PASSENGER AND BAGGAGE COMBINATION CAR

PANORAMIC VIEW OF POMEROY, AS SEEN FROM THE OHIO RIVER

Aside from the cars now being delivered by the J. G. Brill Company, eleven cars comprise the rolling-stock equipment for passenger service, all of which are frequently pressed into use during the summer months. Eight of these cars are of the Brill make, six being ten-bench open summer cars

mounted on No. 21-E trucks for 27-hp motors, and two closed combination passenger and baggage cars mounted on "Eureka" maximum traction trucks for 35-hp motors. An extension of 1½ miles is being built from the present Middleport terminus of the line, passing Fair View Park and on to Hobson, Ohio, the junction point of the Hocking Valley & Kanawha and Michigan Railways, and where is located the large K. & M. shops. This will serve a large number of shop men, train crews and train passengers, and will also handle the United States mails and express business, making it the best revenue producer of any single mile of the road. The new cars will at present be placed on the through service between Middleport and Racine, but after the completion of the Hobson extension it is contemplated to operate them hourly between Hobson and Syracuse, which is the most densely populated district on the line, and the present twenty-minute service will be extended to Syracuse.

INTERIOR VIEW, SHOWING PASSENGER COMPARTMENT

ELECTRIC LOCOMOTIVE HAULING A FREIGHT TRAIN ON THE OHIO RIVER ELECTRIC RAILWAY SYSTEM

The type of car illustrated is well suited to the form of interurban service in which passengers are carried comparatively short distances and enter and leave the car from the roadside. The short-base equalized trucks on which the cars are mounted carry the bodies low and at the same time are capable of 35 miles per hour. In the illustration a number of the windows at the rear of the car are raised into the roof pockets, giving a good idea of the openness when all the windows are raised for summer service. One of the excellent features of storing the sash in the roof pockets, which has not frequently been alluded to, is that the glass is not liable to be broken. Attention is directed to the bright and attractive interior and the wide aisle and commodious seats. The exterior width of the car is but 8 ft. 2 ins., while the interior width, measured between the side linings, is 7 ft. 10 ins., allowing the seats to be 35 ins. long and the aisle 22 ins. wide. The seats are of the builders' manufacture, and have push-over backs with corner grabhandles. Folding seats in the baggage compartment accommodate smokers when the compartment is not filled with baggage. The length of the car over the bodies is 31 ft. 8 ins., and over the vestibules 41 ft. 4 ins.

SAN FRANCISCO NOTES

The most interesting event of the week ending June 23 in San Francisco was the successful inauguration on June 21 of cable car service on the Geary Street Railway. The road passed through the earthquake and fire with very good fortune. Whereas the cable of the California Street road, resting on its pulleys 18 ins. below the surface of the street, was melted in places by the intense heat, the grease was not even melted from the Geary Street cable at any point in the burned district. On the Tuesday preceding the opening the cable was run through the slot and carefully examined as it passed over the drums in the power house, and was found to be intact and in good shape, barring an accumulation of dirt that had sifted into the slot. The company also found that at no place had the conduit suffered from the earthquake and fire, although the slot rails at places in the burned district were badly warped. The cars have been well patronized, and although, as previously, no transfers are given with other lines, the line relieves considerably the congestion of traffic on the electric lines of the United Railroads. In resuming operations with its cable cars the Geary Street road has found trouble only at one point, and that is at the outer end of the line. Heretofore the cars have turned into Fulton Street at Fifth Avenue and continued out Fulton Street to the Chutes, using the cable of the McAllister Street line for several blocks on the latter street. As the McAllister Street cable is no longer running, the Geary Street cars can be operated only as far as Fifth Avenue and Fulton Street, and must be switched at the outer terminus by horses. As a temporary makeshift, however, the arrangement works satisfactorily.

The management of the California Street Railway expects to have a portion of the system running by Aug. 1. Since the day of the fire the employees of the company have been working on the ruins, and most of the wreckage has been cleared away and the machine shops, 45 ft. x 100 ft., are again in working order. An inspection shows that the heavy driving wheels are in good condition. Other portions of the machinery are warped, but it is believed they can be repaired. Should they be beyond repair an order for new machinery will have to be placed and a new plant constructed. It will be a year and a half before the line can be operated by its own power, should this be found necessary. The company lost

fifty-two cars, all that were owned by the road. An order for twenty new ones, to be built on the same lines as the old, has already been placed with an Eastern concern, and these will be ready when needed. The cables of both the California Street and the Hyde Street systems were destroyed, but new ones are available. Work on the O'Farrell, Jones and Hyde Streets line will not be undertaken until the California Street line is in operation.

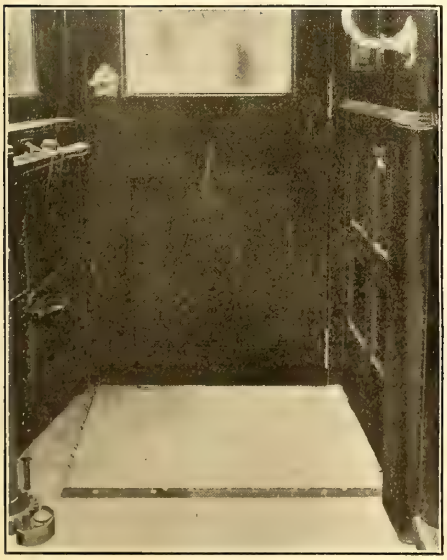
The new cars which the United Railroads has just received will soon be ready for operation. They are of the suburban type, 45 ft. in length, and entirely closed, and are an olive green in color. They were sent on by the Chicago City Railroad Company as soon as they learned that the San Francisco system would need the equipment.

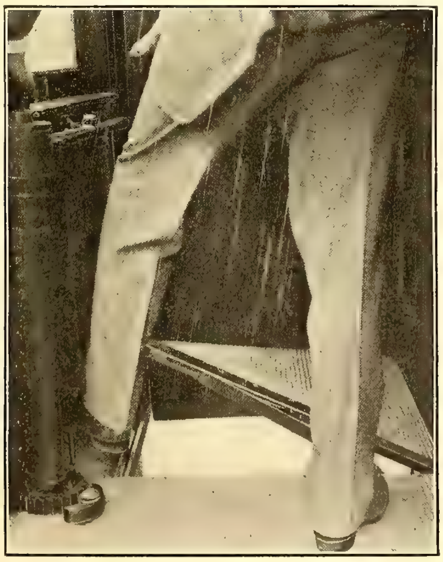
The United Railroads has placed an order with the General Electric Company for twenty-five 4-motor, 40-hp equipments; fifteen 4-motor, 50-hp equipments, and ten 4-motor, 75-hp equipments, all to be supplied with the flexible Sprague-General Electric system of multiple-unit control.

The general offices of the United Railroads have been moved from the Turk and Fillmore car house to the car house at Oak and Broderick Streets. With the exception of the master mechanic, who is still located at the Geneva Avenue car house, and the chief electrician and chief engineer of motive power, who will continue to have their offices at Turk and Fillmore Streets, all of the officers and departments of the company are now permanently located at Oak and Broderick Streets, and will probably remain there for the next year or two, or until suitable quarters of a permanent character can be provided in some modern building in the down-town section.

A FOLDING TRAP FOR VESTIBULES

A short account was published in the issue of June 23 of the exhibit of the Filion folding trap at the exhibit of the


TRAP DOWN


RAISING TRAP


TRAP PARTLY UP AND FOLDED

Master Car Builders and Master Mechanics at Philadelphia. The accompanying illustrations, however, will make the construction of the trap and its method of operation more clear. As will be seen, the trap is in two triangular pieces, hinged together. The outer piece is also hinged to the door and the inner piece to the side of the car. The trap opens and closes with the door by the pressure of the foot upon a treadle. As the parts are hinged there is a tendency to crush any ice which may form on the lower side of the trap.


TRAP FOLDED BEHIND VESTIBULE DOOR

When the door is open the two parts fold behind it so as to offer no obstruction to egress from the car. The trap is also arranged to be raised by a lever between the cars if desired. It is covered in the usual way with rubber, and the edges are bound with brass. The trap has been adopted by some eight or ten steam railroad companies, including the Canadian Pacific Railway, and is being manufactured by the V. O. Lawrence Company, of Philadelphia.

MOTOR CARS TO BE SUPPLIED FOR THE ERIE RAILROAD'S ELECTRICAL DIVISION BETWEEN ROCHESTER AND MT. MORRIS, N. Y.

The Erie Railroad has ordered from the St. Louis Car Company a number of straight passenger motor cars to be used on the 35-mile division to be electrified between Rochester and Mt. Morris, N. Y. These cars will be 40 ft. long over the body, 49 ft. 10 ins. long over the vestibules, and 51 ft. 4 ins. over all; height of the car from the top of the rail to the top of the roof, 13 ft. 4 ins. The cars will be mounted on the car builders' No. 61 trucks, with 34-in. diameter wheels. In addition to the passenger cars there will also be one combination passenger and baggage car and four combination passenger and smoking cars. Further details and drawings of the passenger car will be published in the next issue of the Street Railway Journal.

LONDON LETTER

(From Our Regular Correspondent.)

The eleventh annual convention of the Incorporated Municipal Electrical Association was duly held during the month in London, although the first meeting was held at Kingston-on-Thames, the president of the association this year being J. E. Edgcome, electrical engineer of that town. The headquarters of the association were, however, at the Great Central Hotel, London, and the convention was even more largely attended than usual, an especially large number of ladies being present. The first meeting was held at the Royal County Theatre, Kingston-upon-Thames, where delegates and their friends were welcomed by the Mayor, Councillor H. C. Minnitt, J. P., after which the presidential address was delivered by J. E. Edgcome. A most excellent paper was then read on the subject of steam turbines, profusely illustrated by lantern-slides, by Sydney Baynes, chief electrical engineer of St. Pancras, London. Luncheon was served at 1 o'clock at Nuthall's, Ltd., after which steam launches were provided for a delightful trip on the River Thames. First of all, the launches proceeded down the river, via Teddington and Twickenham to Richmond, where, by kind permission of the Thames Conservancy, the working of the special lock and weir were inspected, the visitors very happily arriving just at the moment when it was necessary to lower the weir. The party then proceeded up the river past Kingston-upon-Thames to East Molesey, where tea was served, after which a short, but interesting visit was made to Hampton Court Palace, which, by special permission of His Majesty's Office of Works, was kept open until late in the evening. A photograph was taken of the party in the courtyard, after which the return was made in the evening to Kingston, from which point a special train took the guests back to London. On the next day the meeting was held at the Hotel Great Central, and papers were read by S. E. Fedden, chief electrical engineer, Sheffield, and H. Collings Bishop, chief electrical engineer, Newport, Mon., on "The Commercial Development of Electricity Undertaking," and J. F. C. Snell, chief electrical engineer, Sunderland, on "Relative Economies of Electric Supply from Small Local Stations and from Power Companies," after which an adjournment was made for luncheon in the hotel. In the afternoon conveyances were supplied and the whole party departed to visit the power station of the Underground Electric Railway Company of London, at Lots Road, Chelsea, which was thrown open for inspection by the permission of J. R. Chapman, general manager and chief engineer. This particular station, at present perhaps the most important and interesting station in Great Britain, elicited the great interest of the delegates, the working of the turbines possessing special interest. Afterward the power station of the London United Tramways, Ltd., at Chiswick, was visited by the permission of Sir Clifton Robinson, managing director and engineer. The next forenoon was devoted to the annual general meeting, and also a special general meeting. After luncheon, conveyances were provided for a visit to the power station of the Charing Cross, West End & City Electric Supply Company, by permission of W. H. Patchell, engineer-in-chief. This station also elicited a great deal of interest, owing to its being one of the most modern of the electrical supply stations in London.

The association's annual dinner, which was largely attended, was as usual an entire success. On the final day of the meeting the following papers were presented: "Live Steam-Heat Feed Water; its Effect on the Output and Efficiency of Steam Boilers," by G. Wilkinson, chief electrical engineer, Harrogate; "The Efficiency of Steam Plant," by W. H. Vignoles, chief electrical engineer, Grimsby; and "The Supply of Power to Tramways from Small Stations," by S. J. Watson, chief electrical engineer, Bury. After luncheon a visit was made to the new power house of the London County Council at Greenwich, which is fully described elsewhere in this issue. On Saturday, an arrangement had been made with the director of the National Physical Laboratory, Bushy House, so that members of the association might visit the laboratory, and of this advantage was largely taken. In the afternoon, invitations had been issued to all members to attend the Kingston, Surbiton and District Life-Boat Saturday Fund Carnival and Water Sports, tickets having been issued for admission to the Albany Club Lawn. A most enjoyable afternoon was spent, and the thanks of all of the delegates were heartily extended to Mr. Edgcome for having provided in connection with the meetings of the convention so many delightful entertainments, at this season of the year Old Father Thames looking his very best, and provided a joy all his own.

As some return for the courtesy extended to the Institution of Electrical Engineers on several visits to the Continent, and the visit to the United States a year or two ago, elaborate preparations have been made this year to provide interesting and pleasant entertainment for a visit of kindred institutions, which takes place this month and extends practically a fortnight from June 23 until July 7. The central committee rooms of the Institution of Electrical Engineers will be situated at the Hotel Cecil, and the first day the visitors will be conducted to Teddington for the opening ceremony of the new electro-technical laboratories of the National Physical Laboratory, by the Rt. Hon. R. B. Haldane, H. M. Secretary of State for War, and a reception and banquet will be held at the Hotel Cecil the same evening. The next day will be devoted to visits to the general post office, telegraphs and telephones, and the London Wall Exchange of the National Telephone Company, the Greenwich generating station of the London County Council, the Bow generating station of the Charing Cross, City & West End Electricity Supply Company, the Lots Road power station of the Underground Electric Railways Company, and the Shepherd's Bush power station of the Central London Railway Company, the visitors being divided into groups as found desirable. In the evening a reception and conversazione by the president, the president elect, and the council of the Institution of Electrical Engineers will be held at the National History Museum, South Kensington. The following day a trip will be made to Windsor, and the next day to Stratford-on-Avon, to Rugby to visit the works of the British Thomson-Houston Company and Willans & Robinson, to Birmingham, where various works will be visited, and on to Manchester, where the party will arrive on June 29. Some of the most important of the electric lighting stations in that city will be visited, as well as the British Westinghouse Electric & Manufacturing Company's Works at Trafford Park, and the Manchester Ship Canal Works. Liverpool will also be visited later, and the important power stations in the vicinity inspected, after which a trip will be made by way of Windermere and the lakes to Glasgow, where entertainment will be provided by the Lord Provost and Corporation of that city. Luncheon will be provided at the famous City Chambers, and a reception and conversazione will be held at the University by the Rt. Hon. Lord Kelvin, chancellor of the University and chairman of the Glasgow local section. Babcock & Wilcox's Works will be visited in the vicinity, and the party will be entertained to a special excursion on the Clyde on the turbine steamer "Queen Alexandra" by that enterprising firm. On returning, a reception and conversazione at the Art Galleries, Kelvingrove Park, will be given by the Rt. Hon. the Lord Provost and Corporation. Edinburgh will be visited on a later day, and interesting excursions have been arranged for to various places in that historic city, after which Newcastle-on-Tyne and Leeds will be visited. Interesting visits to the various enterprises, electrical and otherwise, in both of these busy cities being made. The final day will be spent in Leeds, and visits will be made to certain of the manufacturing companies' works there, and the Yorkshire Electric Power Company's generating station. An excursion will be made to Harrogate, where all the visitors will have the opportunity of drinking the famous waters, and drives will be made to Fountains Abbey and Studley Royal, after which the party will return to Leeds and then by train to London.

Reference has been made frequently in these columns to the immense number of flotations of companies intending to purchase and operate motor omnibuses in the streets of London, and, following hard on their heels, comes now the flotation of a company called the General Motor Cab Company, Ltd., with a capital of £260,000. The company has been formed for the placing in the streets of London and elsewhere a service of motor cabs, which are to be equipped with taximeters in the same manner as the cabs in Berlin, Paris and other Continental cities, to show the exact amount of fare necessary to be paid to the driver. A contract has been entered into between this company and Renault Freres, of Paris, to supply 500 of these motor cabs, and with the proprietors of the taximeter, for the privilege of using this device on the cab. For some years a few motor cabs have been in operation in the streets of London, but they have not been in such numbers that one could say anything as to whether they are really successful or not. Should this company succeed in placing these 500 motor cabs in London, however, there seems good reason to believe that they will be a success, and the writer thoroughly believes that the use of the taximeter is certainly a step in the right direction. The company has got a good board of directors, and it seems to be well backed in every way, so that it is to be hoped that success will follow the company's efforts. Motor cabs are undoubtedly working with great success in Paris, and the writer recently saw large numbers of them in Berlin,

which seemed also to be operating with perfect success. There ought to be no reason why motor cabs should not do well in London, but the general public would have to be assured that the price were reasonable, as hitherto the few motor-cab drivers in London have been apt to extort rather large fares.

At a special meeting of the Oxford City Council, recently, a full report on the tramway situation was presented by the tramways committee. This committee had fully investigated the powers of the corporation to work the existing horse tramways, to take over the tramways themselves, to lease them to a company, to establish a system of motor buses, etc., and finally recommended the adoption of electric tramways, but to lease the undertaking by public tender to an outside company. After discussion the Council adopted the report in so far as accepting electric tramways was concerned, but decided for the present not to adopt the idea of leasing such tramways to an outside company. As an amendment, however, it was finally decided that public tenders might be invited for leasing the undertaking without pledging themselves to lease.

Another London tube involving the amount of £3,000,000, has been approved by Parliament. The bill, which is called the North-West London Railway, has been under the consideration of the committee during the past month. The bill necessarily got the full opposition of the London County Council, as it is promoting bills to put surface tramways on the same route. The route of the North-Western Railway is from Cricklewood to the Marble Arch, and this year the promoters have asked also for powers to continue the railway from the Marble Arch under Hyde Park to Hyde Park Corner, and thence under Grosvenor Place to Victoria.

The Association of Tramway and Light Railway Officials met during the past month at the Balmoral Hotel, Edinburgh, when the association was addressed by the president, H. England. A paper on "Radial Trucks" was read by G. Conaty, of Birmingham, and afterward members were entertained at luncheon by the directors of the Edingurgh and District Tramways Company, Ltd. A visit was afterward made to the Tollcross power station, after which a drive round Edinburgh was provided. The following day a paper was read on "Patent Recording Timekeeper," by A. A. Blackburn, of Belfast. After luncheon there was a discussion regarding the amalgamation with other associations and the usual business meeting of the association. Mr. England's presidential address was strongly in favor of the overhead trolley system, and he stated that he knew no town in the Kingdom which was disfigured by a properly erected overhead system, and even went so far as to say that the city of Edinburgh would have been no less beautiful with such a system. Mr. England also dealt with the opposition of motor buses, and stated that while he thought their unreliability, noise, discomfort and cost of operation prevented them from being feared as competitors at present, yet, in course of time, as these drawbacks were overcome, they might become much more formidable competitors. At the business meeting, J. E. Pitcairn, general manager of the Edinburgh & District Tramway Company, was elected president, and A. R. Fearnley, Sheffield, was elected vice-president.

Members of the managers' section of the Municipal Tramways Association held their annual conference in Sheffield this month. The visitors were received by A. R. Fearnley, of Sheffield, and the conference was presided over by J. B. Hamilton, of Leeds, who is president this year. Mr. Fearnley read a paper descriptive of the Sheffield tramways system, and J. M. McElroy, of Manchester, afterward introduced a discussion on tramways and motor omnibuses. On the following day, the subjects under discussion were: "Economy in Current Consumption," by C. Spencer, of Bradford; "Income Tax and Rates in Connection with Tramway Undertakings," by J. Dalrymple, of Glasgow, and "Track Welding," by J. B. Hamilton, all of which were well received and thoroughly discussed.

Work in various parts of London is being vigorously pushed by several firms of contractors, all working for the London County Council, on the south side, in the east end and also in the northern section, now that the North Metropolitan Tramways has been acquired by the Council. Cars are now being run direct from Westminster Bridge to Rushey Green and Catford by way of Lewisham, this new route being the longest over which electric cars are running at present in London, and the price of fourpence has been fixed as a through fare from Westminster to Catford, a distance of about 7 miles. A small extension has also been made on the Greenwich route by which connection with the Blackwall Tunnel has been effected.

In connection with the opening of the Greenwich power house, it is interesting to note that the Astronomer Royal, Sir W. H. M. Christie, has entered a strong protest against the generating station being built at Greenwich, where all the world knows that the Greenwich Observatory is situated, through which passes longitude zero. Sir W. Christie condemns the action of the London County Council for having placed the power station only half a mile away, as it interferes most extensively with the work of the Observatory. Naturally, the London County Council claims that this protestation should have been made long before the work was commenced for the station on this site, especially as the same trouble occurred only a few years ago in connection with the London United Tramways, which were bitterly complained against by the officials of the Kew Observatory for interference of their work. It is suggested that turbines should be installed in place of the large reciprocating engines which are now at work, but this change, of course, would take considerable time, and the London County Council naturally is not inclined to make this change at this late date. The Admirality is also bringing its influence to bear on the subject, as, from a naval point of view, Greenwich is the centre of the world, and the chronometers of every ship in the navy and merchant marine are set by Greenwich time, and to a thinking mind it is easy to infer that any disarrangement of the instruments in the Greenwich Observatory must have a most serious result in all shipping circles, and in work connected with the scientific observation of the stars. It seems impossible for both the County Council's station and the Observatory to remain where they are. Naturally the Astronomer Royal is totally averse to the removal of the Observatory from its historic associations, and the London County Council naturally is not anxious to close down an undertaking which has cost nearly a million pounds. The question has been brought up in the House of Lords, and it is evident that the Lords of the Admirality are taking the most serious view of the matter, maintaining that the reckoning of every ship at sea depends on Greenwich observations, as well as the position of countries. Our very geography depends on the Observatory, and it was the opinion of the Lords that the Observatory could not be moved, and that if one institution had to be moved it would have to be the power house.

The London County Council electric supply bill is still before the committee of the House of Commons, a fortnight having been consumed by the Whitsuntide vacation. This is the bill, as has already been pointed out, which the Council is promoting for furnishing current in bulk to the London area. The testimony of financial and electrical experts has practically all been concluded for the promoters, who have gone into the question most thoroughly, and the hearing of the opposition is now in progress. Mr. Merz, engineer of the Administrative County bill which failed to pass last year, has given evidence, and naturally is endeavoring to show how his company would be in a much better position to furnish bulk supply than the London County Council. Mr. Ferranti has also given evidence, and many of the electrical engineers of the various companies operating at present in the London area have been on the witness stand. Mr. Conacher, manager of the Metropolitan Electric Supply Company, stated that the authorized capital of the fourteen London companies was over eighteen and a half million pounds, of which more than twelve and a half millions were issued. Many of the companies possessed large generating stations, and he contended that there was ample capacity for furnishing all the current desired. A system of linking up the various companies was advocated by Sir A. B. W. Kennedy, while Mr. Highfield, engineer of the Metropolitan Company, emphatically stated that there was an equally good means of dealing with the problem at hand without the expenditure of such a vast sum of money by the London County Council. Independent experts are now being examined, and it is expected that the inquiry will be over very shortly.

A new and enlarged edition of the "Glasgow Corporation Tramways Official Guide to Glasgow and Neighborhood" has been prepared by the tramways department. The letter-press has been practically rewritten, and a great many additional prints included in the new volume. The guide has been enlarged to cover the extensions which have been opened during the past year, and also describes the districts beyond the present termini. Arrangements are being made to supply each conductor with a number of the guides, so that the traveling public may be able to secure copies on the cars. No change is made in price, which remains at 1d.

A. C. Eborall states that during the course of the present month he will resign his seat on the board of Witting, Eborall & Company, Ltd., to become managing director of Brown, Boveri & Company, Ltd., London. This latter company is now in course of

formation by the well-known Swiss company of the same name, its main object being to take charge of the interests of the Swiss company on Great Britain, the Colonies, and various other countries. The other directors of the English company will be Charles Brown, W. Boveri and C. Baumann, who are also directors of the parent company in Baden. The English Brown, Boveri Company has further arranged to purchase the well-known contracting business of Witting, Eborall & Company, Ltd., and to carry it on and further develop it as a part of the business of Brown, Boveri & Company, Ltd. As a result of this, Messrs. Witting, Eborall & Company, Ltd., have ceased trading, as far as new work is concerned, while their work and contracts in hand, and their various British and Colonial branch offices and agencies, are being taken over, as far as is practicable, by the new company. The offices of Messrs. Brown, Boveri & Company, Ltd., will be situated at Caxton House, Westminster, and Witting, Eborall & Company, Ltd., are also removing their offices from Temple Bar House to that building, where they will remain until such time as various outstanding matters connected with the settling up of their business affairs have been arranged. The English company will have the whole of the resources and experience of the Swiss company behind it, which is now a concern with a capital of £640,000, having works in Baden (Switzerland), Mannheim, Paris, Christiania and Milan, in which altogether over 5000 men, and about 500 engineers and officials are employed.

In connection with this statement, it may be interesting to state that Mr. Eborall was on the staff of Messrs. Brown, Boveri & Company, in Baden, for a considerable time about ten years ago. During the past seven years he has been connected with the firm of Witting, Eborall & Company, Ltd., and their predecessor, Witting Brothers, Ltd., during which time he has been instrumental in building up a business, which is now represented by about half a million pounds worth of machinery, operating in different parts of the world. It is almost needless to say anything regarding the firm of Brown, Boveri & Company, as their pioneer labor in high-pressure transmission work, and the development of the polyphase plant and apparatus is so well known. At the end of 1905, about 600,000 hp of Brown, Boveri turbine machinery was running in different countries, all of which was made at its own factories in Baden, near Zurich, Switzerland. One of the most important examples of their work is the new station at St. Denis, Paris, which will shortly have a capacity of 70,000 kw, the first four sets of which, each of 6000 kw, are already running. The capital of the English Brown, Boveri Company is £50,000.

The electrical equipment of the Hammersmith & City Railway is now approaching completion. The principal part of the work has been carried out by the Great Western Railway, which is thus the first main line entering London to make use of electric traction. The public in London has had some opportunity of estimating the advantages of electric traction since the steam service was replaced by electric trains on the District Railway and partially on the Metropolitan. On the latter, however, a large number of steam trains have continued to run into Moorgate Street, and this has prevented the full benefit of the transformation from being felt. As soon as the Great Western installation is in working order, all steam locomotives can be discarded and all trains can be run at the accelerated rate which can then be attained by electric trains on the Inner Circle. The full effect of the improved conditions will then be felt.

For this equipment the Great Western Railway Company has built its own power house at Park Royal. It contains eight sets of generators, each 750 kw at from 6300 to 6600 volts, built by the Electric Construction Company, of Wolverhampton, coupled direct to Beliss & Morcom triple expansion engine, running at 250 r. p. m., steam being furnished by ten Babcock & Wilcox boilers. Three sub-stations are provided, the motor generators being of the La Caur type, built by Bruce Peebles & Company, of Edinburgh. The whole work has been carried out to the specifications of Kennedy & Jenkins, of London.

At a meeting of the Swansea electric lighting committee, it was resolved to give formal notice to the tramways company to purchase that part of the tramways authorized by the act of 1880, viz., the Alexandra Road section to the docks, being the first section to fall in. The total cost of construction of the new tramways by the corporation, and upon which the rental to the tramways company is to be fixed, was reported at the same meeting to be £108,363 10s. 2d.

The Lancashire United Tramways Company has now commenced linking up their lines from Boothstown with those of the Salford Corporation. When these 2 miles are completed, Manchester and Liverpool will be connected by electric trams.

For some time there has been a yearly loss of £3,000 on the Corporation electric tramways at Lancaster, and there is a strong disposition in the town to lease the undertaking to an outside firm. One offer has been received from a Birmingham company. An alternative proposal was that the Corporation should buy up the horse car system to Morecambe, electrify it, and link it with the Lancaster system; but as the company which owns this system asked £3,000 for it more that the Corporation was disposed to give, the negotiations were abandoned. Another stage has now been reached. The Corporation has called in an expert tramway engineer to look into the whole matter, and in effect he advises the Corporation that the present system cannot pay unless it is extended, and the Lancaster to Morecambe line brought into it. In the end the recommendations of the tramways committee were adopted. These affirmed that the Council could not entertain the Birmingham offer to lease the Corporation tramways, but left it with the committee "to open negotiations with one or more responsible parties, agreeing on conditions, to their acquiring the undertaking of the Lancaster & District Tramways Company, Ltd." The resolution is so loosely worded that several members of the Town Council left the meeting not quite knowing what the Council were committed to.

The tramway committee of Edinburgh Town Council had before them, recently, a letter from Sir Alexander Kennedy, consulting engineer to the Corporation, informing the committee of a number of towns in England which might be visited for the purpose of seeing the various systems of electric traction, overhead, conduit, and surface contact, in operation. The committee decided to recommend the Council to appoint a deputation of seven to inspect the working of the electric tramways in five or six of the English towns. The committee also discussed the proposed agreement between the Edinburgh and Leith Corporations as to the laying down and working of tramway extensions to Granton. It is understood that considerable difference exists between the views of the city and Leith as to what may be regarded as a fair and equitable arrangement for the joint working of the lines. The town clerk of Edinburgh, however, is to have an interview with T. B. Laing, the town clerk of Leith, and after that has taken place the proposed agreement will be again considered by the respective Corporations.

The Parliamentary Commission who have recently been meeting in Glasgow under the chairmanship of the Duke of Argyll, had before them a provisional order promoted by the Glasgow & South-Western Railway Company, under clause 15, of which the company seek powers to run motor omnibuses in connection with their services for the conveyance of passengers and luggage. The clause was opposed by the Corporation of Glasgow, and other municipalities as setting up opposition to the tramway services. James Dalrymple, general manager of the Glasgow tramways, who gave evidence against the scheme, said that if power were given to the promoters and to the railway companies to run motor omnibuses, it would add seriously to the congestion of the street traffic. Cross-examined, he stated that the Corporation objected to the promoters' scheme altogether, because of the resulting opposition to the tramway cars. After hearing counsel, the chairman intimated that the commissioners had decided to disallow the clause.

A. C. S.

PARIS LETTER

(*From Our Regular Correspondent.*)

The period of labor troubles in France coincident with the month of May passed without effect in tramway and light railway circles, which apparently have not suffered. May and June are the months when annual meetings mostly take place and results are put before shareholders. This year no tales have been told other than continued prosperity or smaller losses than preceding years, according to the enterprise; 1905 was not marked by any great increase in the mileage of street railways in France, but several schemes were on paper and have been authorized. The labor troubles, however, have thrown the realization back to an extent, but the effect is but temporary.

The commission which is considering the question of reorganization of Paris transportation matters has not yet been able to arrive at any solution. Various propositions have been made and have been abandoned on account of opposition. There exists a tendency to divide the question into two parts, transport within and transport without the city. This method will not be acceptable to the operating companies, especially the Cie Générale des Omnibus. The latter company has received authority to

erect trolley lines outside the city over several of the existing steam lines now running from Paris to the suburban districts. This permission does not come too early, for some of the steam lines are keenly feeling the effects of competition with electric tramcars.

It was feared that the opening of the southern section of the Paris Metropolitan line No. 2, which runs pretty closely over a portion of the route occupied by the Tramway Sud in Paris, would seriously affect the earnings of the latter. It has been found, however, that such is not the case, and that for the summer at least the traveling public has not deserted the tramway for the railway, although the latter runs above ground for a considerable part of the distance. Yet the tramcar is convenient, and with a good service people are just as willing to take their turn for a tramcar, even at the expense of a little extra time. Within the tunnels of the Metropolitan Railway many a protest is heard against the state of ventilation. The line was not designed with regard to this problem, and experiments are still being made by the operating company to provide, at one or two stations at least, an efficient ventilating service. No great success, however, has attended these efforts, which have been confined mostly to the installation of electric fans or exhaust fans. Special ventilating shafts in the tunnels have not yet been seriously considered, apart from those existing in the stations themselves and afforded by the stairways.

The Nogentais Street Railway, which operates on the south and east of Paris, reports passengers carried during 1905, 24,400,000 for a distance of 4,206,970 car-km, or an increase of 580,000 pasengers and 130,863 car-km. The average receipts per kilometer of track amounted to fr. 42,500. The average receipts per car-km were fr. 72, and the operating ratio was 70.35 per cent. The Nogentais Company is one of the tramway concerns of Paris which has contracted for a supply of power from the new power station which is now under construction at Vitry, in which the units consist of 6000-kw Curtis turbo-generators. This station will probably be in service in a little over a year from date.

The Compagnie Génerale de Railways et d'Eléctricité, one of the group of traction companies in which M. Empain is interested, and whose headquarters are in Brusels, has recently increased its capital from fifteen to twenty-five millions of francs. The price of the issue was 152 frs. 50, for a par value of 100 frs. This points to a very flourishing state of affairs.

The Compagnie Francaise Thomson-Houston which, with its associated companies, has a very important place in French traction affairs, reports the same dividend for 1905 as the previous year, viz., 5 per cent. Its report states that the organization of the transport problem within Paris is being keenly followed, and the company has taken a financial interest in all the three large traction companies which will be called upon to carry out the terms of the reorganization which will be made. The report also states that new works will be erected to undertake the construction of Curtis turbines, for which orders amounting to 32,100 kw have been received to date, a 30 per cent increase over the 1904 figures. Important orders for traction work have been received from the Paris Metropolitan, the Tramway Sud and the Tunis Tramways. The company is also supplying the electrical equipment of the new turbine station at Vitry.

The French Senate passed a law on June 12, some of the clauses of which deal directly with the sale of electric power within Paris. Although the new law will primarily affect the lighting industries of Paris, whose concessions are expiring, yet the clauses practically preclude the exploitation by the municipality of electric enterprises. The ultimate result will doubtless be the more general enlistment of private capital and use of electricity within the city limits both for lighting and traction.

The French Government is pledged to bring up for early discussion a bill tending to repurchase the steam railways of France, regarding which periodical discussion arises. The government has a large majority, and it seems that there is a good chance of seeing some such law pass soon for the purchase of the Ouest and possibly the Orleans railways.

BROOKLYNITES ORGANIZE NEW COMPANY TO BUILD ON LONG ISLAND

Prominent Brooklynites and several of the directors of the Brooklyn Rapid Transit Company are among the incorporators of the Suffolk County Traction Company, capitalized at $1,200,000. The plan of the company is to construct a street surface railroad 28 miles long, between the town of Brookhaven and the village of Babylon, running through Brookhaven, Bellport, Patchogue, Blue Point, Bayport, Sayville and Islip. The directors are Clinton L. Rossiter, D. H. Valentine, Henry Seibert, William F. Sheehan and T. L. Hughes, of Brooklyn; Charles A. Collin, New York; W. H. Jaycox, M. C. Wiggins, G. G. Rose, of Patchogue, and Benjamin H. Wood, of Babylon. Messrs. Seibert and Valentine are directors of the Brooklyn Rapid Transit Company, Mr. Rossiter is a former president of that company, and Messrs. Sheehan and Collin, as members of the firm of Sheehan & Collin, recently dissolved, were for many years counsel for the road.

SPECIAL TRANSIT BODIES APPOINTED IN NEW YORK

The appellate division of the Supreme Court has appointed two sets of Commissioners who are to hold hearings and report to the court whether two rapid transit roads or extensions of the rapid transit system, as approved by the Board of Rapid Transit Commissioners, shall be constructed and operated or not. One of these is known as the White Plains Road route, and the other as the Jerome Avenue subway. The Commissioners appointed to report upon the White Plains Road route are: William W. Niles, Edward H. Healy and Edward R. Finch. Those who are to report on the Jerome Avenue subway are: Charles P. Dillon, Rudolph Bloch and Edward J. McGean.

The White Plains Road route is practically an extension of the present rapid transit elevated viaduct going to West Farms. It is to begin at 177th Street and West Farms Road, near Bronx Park, whence a three-track elevated structure is planned to run along the West Farms Road, Morris Park Avenue and White Plains Road to its intersection with East 241st Street, which is the boundry of Mount Vernon. The Jerome Avenue subway consists, in the first place, of a four-track subway running under Jerome Avenue from about 164th Street to the junction with Woodlawn Road, opposite Woodlawn Cemetery. From the south end of said line, also, two connections are provided, with railways in Manhattan. The first is a three-track connection leading to the bridge over the Harlem River belonging to the Putnam division of the New York Central & Hudson River Railroad Company. The other is a two-track subway passing under the Harlem River to a point in Eighth Avenue near 154th Street so as to connect with a subway to be hereafter constructed under that avenue. A third spur is planned to connect with 153d Street, near Cromwell Avenue, so as to afford a junction with the proposed Lexington Avenue subway.

ST. LOUIS & SUBURBAN SECURED BY NORTH AMERICAN COMPANY

The St. Louis & Suburban Railway Company, with its constituent properties, the St. Louis & Meramec River Railroad Company, the St. Louis & Kirkwood Railroad Company, and the Brentwood, Clayton & St. Louis Railroad Company, will pass to the control of the United Railways Company, which is controlled by the North American Company. The basis of the transaction is that each share of Suburban stock will be exchanged for one share of United Railways preferred. The United Railways stock which will be thus acquired will be without dividends for eighteen months. The reason for the ex-dividend specification is that the money obtained in this manner will be needed to connect up the Suburban tracks in the city and the county with tracks of the United Railways lines and to make necessary improvements.

When the United Railways Company acquires control of the Suburban a policy of managerial economy will be applied. The operation of suburban and interurban cars will be changed in such a way as to dispense with unnecessary accommodations, and the service between the city and the county—that is, in the suburbs—will be improved. County lines will be connected up and practically a new suburban and interurban service will be established. The announcement of the basis of the transfer of the suburban properties has been made in order to give stockholders who are not in the Suburban pool a chance to get the same price for their holdings as stockholders who are in the pool. When the negotiations are concluded, a formal announcement of the transaction and the plans will likely be made. The St. Louis & Suburban Railway Company was incorporated in 1892 under the laws of Missouri, as a reorganization of the St. Louis Cable & Western, which was sold at foreclosure in 1890. It comprises the St. Louis & Suburban Railway, the St. Louis & Meramec River Railroad, the St. Louis & Kirkwood Railroad, and the Brentwood, Clayton & St. Louis Railroad. There are 120 miles of track in the city and county of St. Louis.

CHICAGO TRACTION MATTERS

The work of electrifying the electric and cable railway lines of the Chicago Union Traction Company inside the loop district is progressing rapidly. The wire is up on Adams Street as far as State Street, and the electric cars which were formerly hauled from South Fifth Avenue to State Street by horses are now carried to the end of the line by electricity.

The poles for the overhead construction on Dearborn Street have been distributed and are fast being set.

As announced briefly in the last issue of the Street Railway Journal, bids have been advertised by the Chicago Union Traction Company, for the lowering of the tunnels under the Chicago River. These bids are to be opened in the office of W. G. Gurley, counsel for the company, on July 5. The bids were "for lowering and making changes in Van Buren Street tunnel, under the south branch of the Chicago River; also for the building of a new roof over the river section of the tunnel under the south branch of the Chicago River at Washington Street; also for the building of a new roof of the tunnel under the Chicago River at La Salle Street." The advertisements stated that bidders must be prepared to commence work immediately on acceptance of their bids, or at such time within 90 days after acceptance as the chief engineer directed.

A report on street railway casualties in Chicago has been prepared by Maurice F. Doty, traction expert for Mayor Dunne. A summary of the report is as follows:

During fifty days fifty-two accidents occurred, 107 persons were injured, including twenty-one persons killed outright or died within a few days. Others are not expected to live.

The following conditions were in whole or in part the cause:

1. Crowded cars in seven cases particularly and in the majority of cases generally.
2. High fenders in eleven cases.
3. High or no wheel guards in seventeen cases.
4. Stepped on or off moving car, usually backwards, in twenty-one cases.
5. Flipping cars in three cases.
6. Faulty brakes in four cases.
7. Knocked off wagon in eight cases.
8. Ran into car in fourteen cases.
9. Collision in six cases.
10. Low platform in one case and probably in two other cases.
11. Rolled between the big wide cars in two cases.
12. Cars jumped track in three cases, owing to poor track.
13. Trolley pole broke in two cases.
14. Slippery rails in three cases.
15. Lack of coil springs between motor and trailer, presence of which might prevent some of the trailer accidents.
16. Rough, uneven, and crooked tracks.

Mayor Dunne in commenting on the report, said:

"It is astounding to think of the loss of life through the seeming carelessness or negligence of the street railway companies of Chicago. Think of it—twenty-one people killed in fifty days! Dr. Doty's report amazed me. It was almost unbelievable. But he seems to have the facts, and they speak for themselves.

"I recently read a report which showed that in Liverpool, which is a very large city, there were three people killed by street cars in eighteen months. If Liverpool makes a record like that in a year and a half, and Chicago kills twenty-one people in less than two months, it is time to make a searching investigation."

It is reported that the street railway corporations are preparing to combat the charges of responsibility for the accidents. The officials claim that nearly all of the accidents are due to carelessness on the part of the victims.

In a report to the committee of the City Council, of Chicago, made Monday, July 2, by B. J. Arnold, traction expert, and approved by Walter J. Fisher, the Mayor's special adviser in traction matters, downtown subways to aid in making a model street car system for Chicago are advocated. Through routes and universal transfers are insisted on. Mr. Arnold believes the old river tunnels, doomed to removal by the War Department, should be retained as part of the subway system. He estimates the cost of construction of the subways at $4,800,000.

IMPORTANT SOUTHERN PROJECT

The Roberts & Abbott Company, of Cleveland, has closed the contract for the engineering work for one of the most extensive interurban freight lines ever built in this country, and the largest interurban proposition in the South. The road will extend from Gadsden to Tuskaloosa, Ala., by way of Birmingham. The contracts were closed last week in Washington, where E. P. Roberts, president of the Roberts & Abbott Company, met J. M. Dewberry, president of the Tidewater Development Company, which is back of the railway project. The main line and sidings will include about 139 miles of track. The road will be essentially a freight line, and has for its object an independent freight route to the sea. Connecting with the Warrior River at Tuskaloosa, it is stated that the line will not only give the business interests of Birmingham the advantages of interurban passenger and freight service, but place the advantages of the river at the disposal of the mining and manufacturing interests of the district. The final surveys for the line will be made immediately. W. H. Searls, a prominent steam road engineer, will represent the Roberts & Abbott Company in the field and will have charge of a force of forty field men.

ANNUAL REPORT OF THE LISBON ELECTRIC TRAMWAYS

In London, on June 13, the directors of the Lisbon Electric Tramways, Ltd., of Lisbon, Portugal, presented the sixth annual report covering the company's business for the year ending Dec. 31, 1905. After deducting interest and amortisation, due on the debentures of "Companhia Carris de Ferro de Lisbon," and after the payment of $121,500 for interest on the debentures of this company, and the payment of London office expenses and directors' renumeration, the net profit was $445,867. As a balance of $78,475 was brought forward from last year the total balance was $524,341. From the last amount $170,100 has been placed to depreciation and $24,300 to the credit of exchange reserve account. Out of the surplus remaining a 6 per cent dividend will be paid on the preferred stock, and the directors have also recommended a 5 per cent dividend on the common stock.

During the year 40,065,125 passengers were carried, about 5½ miles added to the system, and many additions were made to the rolling stock and power house.

NEW PUBLICATIONS

Manual of Statistics for 1906. The Manual of Statistics Company, New York. 1056 pages. Price, $5.

This is the twenty-eighth annual issue of this publication, and contains, as usual, information in regard to railroad and industrial corporations, the quotations for securities in the New York, Boston, Chicago, Philadelphia and other markets, and complete statistics relative to cotton and grain, together with a comprehensive directory of banks at leading cities.

Single-Phase Commutator Motors. By Franklin Punga, translated from the German by R. F. Loser. London, Whittaker & Company. New York, The Macmillan Company. Cloth; 187 pages. Price, $1.75.

Moteurs a Collecteur a Courants Alternative. By Dr. F. Niethammer, Paris. Paper; 129 pages. Price Fr. 5.

The attention given commercially to the single-phase motor for railway purposes has created a demand for treatises on the subject like the above. A discussion on the single-phase motor is necessarily largely made up of a discussion on the sparking trouble, so that it is not surprising that both of these books should be devoted to a considerable extent to a consideration of the reasons for sparking and its remedy. The book by Mr. Punga also takes up the details of the design of the single-phase series and repulsion motors, while a considerable part of Dr. Niethaunner's work considers the construction of commercial motors and methods of control.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JUNE 26, 1906

824,118. Track-Sanding Device for Street Railway Cars; Denis Hogan, Denver, Col. App. filed March 23, 1906. In case of emergency the shutting off of the power automatically opens the sand discharge valves.

824,183. Track Clearer; William E. Knowlton, Portland, Me.

App. filed Feb. 20, 1905. A device for removing ice from street railways tracks, consisting of a series of pivoted discs set at an acute angle to the line of motion of the car and adapted to roll on the ice.

824,188. Removable Car for Railways, etc.; Philip J. Mitten, Milwaukee, Wis. App. filed Sept. 25, 1905. Details of construction of a repair car.

824,201. Trolley for Railway Vehicles; John D. Paton, Edgewood Park, Pa. App. filed June 28, 1905. A trolley for high-speed railways having a horizontal conductor, spring supported by a frame or trellis capable of yielding in a downward direction. The horizontal bar has certain link connections with the trellis whereby it maintains a horizontal position in use.

824,209. Railway Car; Myron Rounds, Boston, Mass. App. filed Jan. 12, 1906. A vestibule car in which the opening of the car door lowers a step, which is again raised by the closing of the door.

824,271. Portable Railway Cross-Over Switch; John B. Aldrich and Arbia L. Aldrich, Endicott, N. Y. App. filed April 9, 1906. A track section composed of rails of higher cross-section than ordinary rails, switch points for the ends of the sections having their upper sides inclosed and cross-over sections recessed in and detachably connected to the opposing ends of the first-mentioned sections where the latter are approximate to the inner track rails, and bearing on the heads of the inner track rails.

824,314. Electric Locomotive and Means for Controlling the Same; Frank L. Sessions, Columbus, Ohio. App. filed Aug. 6, 1903. A mining locomotive having a flexible cable which unwinds from a reel behind the car. Provides a stationary device at a point remote from the car for reversing the electric current passing through more or less of the flexible conductor sections and through one element of the motor.

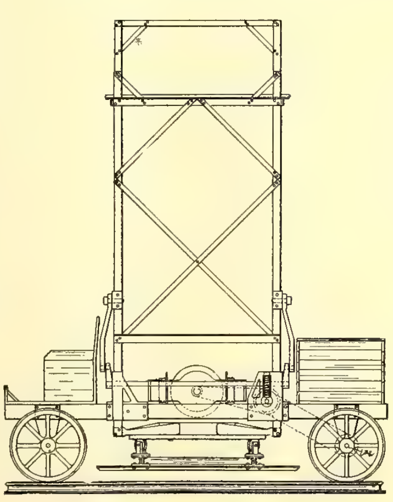
824,393. Passenger Car; Henry F. Vogel, St. Louis, Mo. App. filed Feb. 8. 1906. The car seats are mounted upon revolving pedestals which themselves have a limited movement through their connection to the floor, thereby permitting adjustment by the passengers to suit their convenience.

824,467. Car Brake; Henry B. Burke, Windber, Pa. App. filed Feb. 20, 1906. Details of construction.

824,519. Car Fender; Mathias Wick, New York, N. Y. App. filed Aug. 5, 1905. Comprises a guard consisting of a series of pivoted frames, certain of which comprise a pair of bars telescopically connected together, a spring in the outer telescoping bar for forcing the inner bar in an outward direction, and means for connecting the inner bar with the stationary portion of the device for preventing the springs from acting beyond a certain point, and for retracting the inner bar when the frames move beyond a certain point.

824,541. Car Fender; Charles Hager and Thomas D. Finzie, New York, N. Y. App. filed April 10, 1906. A side fender which is hinged to the body of the car outside of the wheels.

824,542. Car Fender; Charles Hager and Thomas D. Finzie, New York, N. Y. App. filed April 10, 1906. Comprises a reticulated sheet-steel plate and a reticulated supplemental portion hinged thereto.



PATENT NO. 824,188

824,580. Signaling Device; Charles C. Phillips, Owensboro, Ky. App. filed March 29, 1906. Tappets adjacent to the track rail and specially constructed semaphore signals which are arranged to be mechanically moved to one position by the tappets and tripped to the reverse position by an electromagnet.

824,611. Trolley Keeper; Benjamin C. Bartlebaugh, Benwood, W. Va. App. filed Sept. 12. A spring guard mounted on the trolley harp and adapted to overlie the conductor and keep the wheel in place. The guard is displaced in passing hangers, etc., and may be displaced by a cord connection when it is desired to remove or replace the wheel upon the wire.

824,625. Rail-Bond; John P. Clark, Ypsilanti, Mich. App. filed Oct. 23, 1905. A rail-bond having a terminal provided with a piece of wire-cloth on its under side which is extended laterally beyond the sides of the terminals.

824,629. System of Control for Electric Motors; William T. Dean and Rudolph Tschentscher, Chicago, Ill. App. filed Nov. 2, 1905. A multiple unit control system having only two wires for connection between the cars for the pilto circuit.

824,649. Railway Cross-Tie; Luphfer I. Hart, Vanatta, Ohio. App. filed April 25, 1906. Consists of a wooden core surrounded wholly by a cement body.

PERSONAL MENTION

MR. JAMES B. McQUEENEY has been appointed general freight agent of the Brooklyn Rapid Transit Company.

MR. L. M. LEVINSON, manager of the Shreveport Traction Company, was on June 8 elected to the directory and secretaryship of the company. No other change was made in the directory.

MR. LORENZO BENTLEY has resigned as superintendent of the New London & East Lynne Street Railway Company, of New London, Conn. Mr. Judson S. Cousins has been appointed to succeed Mr. Bentley.

MR. LOUIS CASSIER, of New York, publisher of "Cassier's Magazine" and the "Electrical Age," was one of the unfortunate victims of the appalling railroad disaster on the London & Southwestern Railroad on Sunday, July 1.

MR. J. A. GIBSON, for six years local manager of the Meridian Light & Railway Company, of Meridian, Miss., has been appointed to the position of second vice-president of that corporation, and will be succeeded as manager by Mr. L. B. Patterson.

MR. J. EDWARDS WOODBRIDGE, of the British Thomson-Houston Company, was married June 19, at Rugby, England. Mr. Woodbridge was formerly with the General Electric Company, of Schenectady, and previously for several years was editor of the "American Electrician."

MR. HERBERT McNULTA, of Chicago, has been appointed chief engineer for the Cincinnati Traction Company, Cincinnati, Ohio. Mr. McNulta is a graduate of the United States Naval Academy, has had a wide experience in mechanical and electrical engineering, as applied to railway work.

MR. PAUL K. CLYMER, who for a number of years has been one of the directors of the Ithaca Street Railway Company and its subsidiary branches, the Cayuga Lake Road, the Ithaca & Cayuga Heights lines and the Brush Swan Electric Light Company, of Ithaca, N. Y., has resigned from these companies.

MR. JILSON J. COLEMAN, of New York, has just accepted an offer from the Murphy Varnish Company, of Newark, to become connected with the sales department of that company. The Murphy Varnish Company has never attempted to do very much business with the electric roads, but this appointment indicates that it will now actively enter the street railway field.

MR. B. H. FISHER, chief engineer of the North Shore Railroad, of California, is dead. Mr. Fisher was a graduate of Cornell University, and was well known on the Pacific Coast, having been connected with the Atchison, Topeka & Santa Fe Railway, Albuquerque Electric, Water & Gas Works, Oakland-Alameda Belt Railway, and the North Shore Railroad.

MR. EDWARD C. BOYNTON has been appointed representative in the East of the W. T. Van Dorn Company, of Chicago, and will shortly make a trip through the New England States and Canada in the interests of the Van Dorn couplers. Mr. Boynton was for a number of years electrical engineer of the New York, New Haven & Hartford Railroad Company, and under his supervision the original third-rail lines at Nantasket, Mass., and New Britain, Conn., were installed. Following this connection, Mr. Boynton was for a number of years in the air brake engineering department of the National Electric Company, and has lately been engaged on some special work in connection with Mr. Albert B. Herrick.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Report since opening of road March 17, 1906.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O.	1 m., May '06	84,469	45 913	38,556	22,666	15,889
Northern Ohio Tr. &	1 " " '05	78,587	40,792	37,795	22,917	14,878
Light Co	5 " " '06	368,072	208,578	159,494	113,334	46,160
	5 " " '05	340,315	191,077	149,239	114,585	34,655
	1 m., May '06	24,741	12,430	12,311	7,432	4,879
BINGHAMTON, N. Y.	1 " " '05	23,277	10,985	12,292	7,188	5,103
Binghamton Ry. Co.	11 " " '06	261,691	136,743	124,949	80,367	44,581
	11 " " '05	234,907	124,909	109,998	77,285	32,714
CHAMPAIGN, ILL.	1 m., May '06	226 529	*127,406	99,123	------	------
Illinois Traction Co	1 " " '05	187,120	*104,924	82,196	------	------
	5 " " '06	1,107,295	*633,095	474,200	------	------
	5 " " '05	905,631	*506,264	399,367	------	------
CHARLESTON, S. C.	1 m., May '06	52.879	32,649	20,230	12,967	7,263
Charleston Cons. Ry.	1 " " '05	50,016	29,241	20,775	12,917	7,858
Gas & Elec. Co	3 " " '06	154,875	96,000	58,875	38.901	19,974
	3 " " '05	142,981	86,730	56,251	38,750	17,501
CHICAGO, ILL.						
Aurora, Elgin & Chicago Ry. Co	1 m., Apr. '06	89,981	51,749	38,232	24,939	13,293
	1 " " '05	79,968	47.414	32,454	24,919	7,535
	1 m., May '06	69,813	26,445	43,368	------	------
Chicago & Milwaukee	1 " " '05	44,213	20,557	23,655	-----	------
Elec. R. R. Co	5 " " '06	247,318	116,538	130,779	------	------
	5 " " 05	158,756	81,751	77,005	------	------
	1 m., May '06	23 190	*12,152	11,038	------	------
CLEVELAND, O.	1 " " '05	20,681	*11 463	9,218	------	------
Cleveland, Painesville	5 " " '06	86,630	*51,855	34,775	------	------
& Eastern R.R. Co	5 " " '05	75,475	*49,946	25,529	------	------
	1 m., May '06	47,028	26,253	20,775	------	------
Cleveland & South-	1 " " '05	54,219	30,202	24,017	------	------
western Traction Co.	5 " " '06	188,818	121,963	66,855	------	------
	5 " " '05	230,219	141,383	88,837	------	------
	1 m., Apr. '06	63,685	*37,786	25,899	20,404	5,495
	1 " " '05	54,734	*32,653	22,081	20,404	1,677
Lake Shore Electric	4 " " '06	228,900	*138,477	90 423	81,616	8,806
	4 " " '05	200,584	*128,424	72,160	81,616	†9,456
	1 m., May '06	566,055	*314,373	191,682	105,478	86,204
DETROIT, MICH.	1 " " '05	433,734	*251,917	181.817	92,806	89,011
Detroit United Ry	5 " " '06	2,222,940	*1354612	868,328	499,447	368,881
	5 " " '05	1,884,455	*1167493	716,962	460,559	256,403
	1 m., Apr. '06	62,181	31,841	30,339	17,524	12,815
DULUTH, MINN.	1 " " '05	52,878	27,798	25.080	16,754	8,325
Duluth St. Ry. Co	4 " " '06	225,355	129,190	96,165	70,007	26,158
	4 " " '05	194,785	110,258	84,527	66,942	17,585
	1 m., Apr. '06	114,439	60,195	54,244	------	------
EAST ST. LOUIS, ILL.	1 " " '05	111,024	50,546	60,478	------	------
East St. Louis & Su-	4 " " '06	349,652	194,433	155,219	------	------
burban Co	4 " " '05	328,762	160,798	167,804	------	------
	1 m., Apr. '06	79,543	50,947	28,595	------	------
FT. WAYNE, IND.	1 " " '05	68,509	42,834	25,675	------	------
Ft. Wayne & Wabash	4 " " '06	311,631	194,680	116,951	------	------
Valley Tr. Co	4 " " '05	266,597	168,230	98,367	------	------
	1 m., Mar. '06	64,738	39,826	24,911	9,942	14,970
FT. WORTH, TEX,	1 " " '05	53,689	31,221	22,468	9,938	12,531
Northern Texas Tr. Co	12 " " '06	694,654	419,063	275,591	120,429	155 162
	12 " " '05	581,717	336,173	245,544	110,908	134,636
	1 m., May '06	19,178	7.122	12,056	4,442	7,614
GREENSBURG, PA.	1 " " 05	16,616	8,191	8,425	------	------
Pittsburg. McKeesport	5 " " '06	73,685	34,370	39 315	23,359	15,956
& Greensburg Ry. Co.	5 " " '05	60,204	30,803	29,401	------	------
	1 m., Apr. '06	17,966	*11,647	6,318	3,937	2,382
HANCOCK, MICH.	1 " " '05	2,056	*25,985	†23,929	3,615	†27,544
Houghton County St.	12 " " '06	198,460	*144,527	53,933	45.303	8,630
Ry. Co	12 " " '05	173,308	*160,148	13,160	41,280	†28,120
	1 m., May '06	57,357	48,977	8,380	------	------
HARRISBURG, Pa.	1 " " '05	50,636	40,855	9,781	------	------
Central Penn Trac. Co.	5 " " '06	254,748	236 360	18.388	------	------
	5 " " '05	210,806	193,118	11,688	------	------
	1 m., Apr. '06	47,173	*30,811	16,362	7,692	8,670
HOUSTON, TEX.	1 " " '05	40,377	*25,311	15,066	8,713	6,354
Houston Electric Co.	12 " " '06	546,457	*339,441	207,016	102,547	104,469
	12 " " '05	385,828	*325,441	60,387	99,801	†39,414
JACKSON, MICH.	1 m., May '06	12 170	7,371	4,799	2,879	1,920
Jackson Cons. Tr. Co.	1 " " '05	9,935	5,863	4,072	2,687	1,385
	5 " " '06	51,377	------	------	------	------
	5 " " '05	41,321	------	------	------	------
LEECHBURG, PA.						
Pittsburg & Alleghany Valley Ry. Co	1 m.,‡Apr.'06	6,527	2,556	3 971	3,125	846
MANILA, P. I.						
Manila Elec. R. R. & Lt.	1 m., May '06	44,000	22,250	21,750	------	------
Co., Railway Dept	5 " " '06	218,830	109,485	109,346	------	------
	1 " " 06	72,000	37,650	34,350	------	------
Total, all depts	5 " " '06	366,286	186,678	179,609	------	------
MILWAUKEE, WIS.	1 m., May '06	284,499	153,428	131,070	89,719	41,351
Milwaukee El. Ry. &	1 " " '05	268,334	133,285	135,049	77,089	57,960
Lt. Co	5 " " '06	1,370,866	693,811	677,055	437,411	239,645
	5 " " '05	1,270,836	649,117	621,719	371,708	250,011
	1 m., May '06	50,167	22,068	28,099	25.454	2,645
Milwaukee Lt., Ht. &	1 " " '05	47,398	21,166	26,232	20,435	5,798
Tr. Co	5 " " '06	227,490	98,585	128,905	117,954	10,951
	5 " " '05	201,661	99,840	101,821	96,34.	5,480
	1 m., May '06	448,104	209.263	238,841	110,592	128,249
MINNEAPOLIS, MINN.	1 " " '05	389,425	172,504	216.921	97,208	119,712
Twin City R. T. Co	5 " " '06	2,070,018	998,838	1,071,180	549,425	521,755
	5 " " '05	1,778,942	861,674	917,268	486,508	430,760
	1 m., May '06	264,252	149,074	115,178	47,236	67,942
MONTREAL, CAN.	1 " " '05	236,399	134,693	101,706	28,749	72,958
Montreal St. Ry. Co	8 " " '06	1,906,190	1,214,359	691,832	266,975	424,857
	8 " " '05	1,675,791	1,120,927	554,865	169,654	385,211
	1 m., May '06	11,726	7,552	4 174	------	------
NEWBURGH, N. Y.	1 " " '05	11,445	6,789	4,656	------	------
Orange Co. Trac. Co	5 " " '06	43,898	34,793	9,105	------	------
	5 " " '05	39,016	31,651	7,365	------	------
NEW ORLEANS, LA.						
New Orleans Ry. &	1 m., May '06	470,901	261,047	209,854	154,806	55,048
Lt. Co	5 " " '06	2,452,810	1,279,149	1,173,661	761,481	412,180
OAKLAND, CAL.	1 m., Apr. '06	151,525	67,817	83,709	35,678	48,030
Oakland Trac. Con	1 " " '05	122,247	57,003	65,243	------	------
	1 m., Apr. '06	9,921	4,658	5,262	2,768	2,495
OLEAN, N. Y.	1 " " '05	10,935	6,487	4,448	2,968	1,480
Olean St. Ry. Co	10 " " '06	104,603	52,092	52,511	26,879	25,632
	10 " " '05	94,340	48,079	46,261	26,868	19,393
	1 m., May '06	225,648	------	------	------	------
PHILADELPHIA, PA.	1 " " '05	211,210	------	------	------	------
American Rys. Co	11 " " '06	1,852,720	------	------	------	------
	11 " " '05	1,750,256	------	------	------	------
ST. LOUIS, MO.	1 m., May '06	805,183	*490,367	314,816	198,026	116,790
United Railways Co.	1 " " '05	757,481	*475,566	281,915	198,954	82,961
of St. Louis	5 " " '06	3,608,865	*2240428	1.368,437	991,296	377,141
	5 " " '05	3,299,987	*2248051	1,051,936	996,497	55,439
	1 m., Apr. '06	49,872	*29,982	19 891	10,978	8,913
SAVANNAH, GA.	1 " " '05	46,333	*26,521	19,811	10,554	9,257
Savannah Electric Co.	12 " " '06	607,130	*366,706	240,424	129,169	116,256
	12 " " '05	557,209	*320,882	236,327	127,247	109,080
	1 m., Apr. '06	231,492	*153,058	78,434	27,076	51,359
SEATTLE, WASH.	1 " " '05	203,425	*144,124	59,301	24,765	34,536
Seattle Electric Co	12 " " '06	2,704,362	*1743138	961,224	297,099	664,125
	12 " " '05	2,367,280	*1633666	733,614	299,948	433,666
	1 m., May '06	87,628	50,724	36,904	23,257	13,647
SYRACUSE, N. Y.	1 " " '05	77,590	45,521	32,069	20,386	11,683
Syracuse R. T. Co	5 " " '06	428,125	244,315	183,810	112 400	71,410
	5 " " '05	373,268	219,781	153,487	101,952	51,535
	1 m., Apr. '06	61,133	*35,567	25,566	13,011	12,555
TERRE HAUTE, IND.	1 " " '05	46,761	*34,779	11,982	8,744	3,238
Terre Haute Tr. & Lt.	12 " " '06	683,996	*435,984	248,012	134,898	113,114
Co	12 " " '05	583,446	*374,229	209,217	113,049	96,168
	1 m., Apr. '06	156,396	*83,623	72,773	42,213	30,560
TOLEDO, O.	1 " " '05	147,159	*79,153	68,006	41,765	26,241
Toledo Rys. & Lt. Co.	4 " " '06	616,543	*326,639	289,904	169,208	120,696
	4 " " '05	578,074	*300,148	277,926	170,149	107,777

Street Railway Journal

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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 229,100 copies, an average of 8182 copies per week.

The Last of the Cable Cars in Chicago

At last the cable cars of Chicago are to go. Both the Union Traction Company and the Chicago City Railway Company have agreed to the recently passed ordinances providing for the substitution of the trolley for the cables, and are now putting up the overhead system. It is safe to say that no one regrets their passing out of existence, and least of all the companies. The sooner they go, the better for all concerned. The people are tired of traveling at their slow, monotonous pace and of being subjected to the racking and jolting of the single-truck cars. The operating companies are as weary of the limited carrying capacity of the overloaded cable lines, of the expenses of maintenance of the worn-out equipments, and of the frequent breakdowns.

But the passing of the cable does not mean the settlement of the traction situation in Chicago. It is only a temporary expedient, and was brought about to a great extent by the necessity for lowering the tunnels under the Chicago River. A final settlement will carry with it some scheme for a complete overhauling of the different systems. Of the plans being considered, those which provide for the ultimate purchase of the lines by the city seem to be a happy solution to the long vexing problem. If for any reason the city can not purchase them, they may be bought by an outside company at a value a little above the worth of the actual properties. This plan will at least put the present companies in a position where they will feel warranted in making the investments necessary to modernize their systems. When this is done, no doubt the majority of the people will be satisfied, and then it is very probable that the municipal ownership idea will gradually weaken.

Terminal Stations

It is difficult to say which feature attracts the attention of the visitor most in the magnificent terminal station and office building in Milwaukee, which we describe in this week's issue—the convenience and the completeness with which every detail which would add to the convenience of the users of this building has been thought out and wrought out, or the care devoted to the decorative features and the success which has been achieved in their treatment. The Milwaukee company has always had the reputation of doing thoroughly whatever it undertook, and having decided upon a terminal and office building, no pains were spared to make it not only the best which could be had for the purposes for which it was designed, but also to make it an ornament to the city in both exterior and interior decoration. Opinions may differ as to the benefits to be derived by the erection of handsome buildings by a purely business corporation. Some undoubtedly would claim that a company organized exclusively for profit should keep its structures within plain lines and should design them for utilitarian purposes only. Fortunately, however, this idea is passing away. A walk through the downtown streets of any of our large cities which are lined with modern buildings will show the increasing tendency toward

the artistic, even in business structures. The most important corporations, whether they supply transportation or something else which the public needs, and those which are governed by the broadest principles, realize that there is not only a direct monetary advantage in the erection of handsome office buildings, stations, and so on, but that it is also a duty which they owe to the public. And the larger and more important the corporation the more it is called upon to erect its necessary structures in a form which will be a subject of pride to the community from which it derives its support. We do not mean that many railway companies are in a position to duplicate or approximate the work recently accomplished in Milwaukee, but we do believe that the example set in that city by the company in the construction of its public service building is the right one to follow; that more attention will be devoted to artistic effect in public buildings in the future than has been the case in the past, and as public service corporations increase in importance there should be and will be more of an effort to plan their work so that whatever they will do in the way of construction will be an ornament to the city in which they conduct their business.

Accidents in Getting On and Off Cars and Their Prevention

The report of the accidents on the Chicago street railway lines prepared for Mayor Dunne, to which we referred last week, shows that twenty-one accidents out of a total of fifty-two were caused by people stepping on or off moving cars. For accidents of this nature, it is true, the operating company is not to blame. But it is interesting to consider, when such accidents are frequent, whether they could be reduced either by educating the public to the danger of attempting to leave or to board a moving car, or the more strenuous method of providing gates which make it impossible for them to do so.

The report states that the accidents were usually caused by people getting off backwards. It is presumable that women were usually the victims. It is rather inexplicable why women instinctively choose the most dangerous way possible to get off a car. Some companies, including those in Chicago, have attempted to reduce this practice by placing notices about the car cautioning passengers against this method of dismounting.

But no matter how hard the companies may try to impress on the passengers the dangers of getting on and off cars when in motion, it does not seem that accidents from this cause can be completely eliminated. When a person has to run to catch a car he is likely to put everything else out of mind but the desire to get on board, and consequently forgets any previous cautions.

About the only way in which such accidents can be cut down effectively is to adopt some type of gate, like that used in Minneapolis, which can be kept closed except while the car is standing. A mirror is usually placed on the vestibule post at such an angle that the rear entrance controlled by the gate is visible to the motorman when standing before the controller. The motorman opens the gate only after the car has stopped and closes it just before he throws on the power.

We do not believe this precaution is always or even often necessary, and undoubtedly its introduction in any city would raise a storm of protest from patrons, certainly at first. But as a final resort it is worth considering. About the only argument against it is that time is lost in loading and unloading passengers. But this argument does not seem to hold in the light of the results obtained where the gate has been in use. Immediately after its adoption there will naturally be considerable confusion and inconvenience, due to the fact that both the trainmen and the public are not accustomed to it. But as soon as all get used to it no delays are caused by its presence, and its adoption makes accidents in getting on and off cars of rare occurrence.

Another argument in favor of such a gate is that it permits the conductor to forget completely the rear platform, and allows him to give more of his attention to the collection of fares.

Making History in the Central West

The past few weeks have been an epoch making period in the history of the great network of electric lines in the Central Western States of Ohio, Michigan and Indiana. The roads in that district have been undergoing changes similar to those which took place in the history of the steam roads several decades ago. Originally these larger transportation enterprises were built in short links between important centers. Then they were connected up into through lines operating separately. Many of the properties were over-capitalized or were incapable of supporting themselves as single units, so that the original promoters failed or were obliged to sell out at a loss. Gradually the lines were consolidated into long roads, and finally these roads were in turn brought together into great systems. The institution of economies in operating, the creation of new business by reason of long-distance connections, the squeezing out of watered stocks, the improvements in equipment and speed, all have combined to make the steam railroads of to-day the most substantial business institution in the country, where formerly they were weak members, each fighting the other and struggling for an existence.

This is exactly the transition which is rapidly coming to a focus among the electric interurban roads of the Central West, and as intimated, some very important incidents in this history have just taken place. On July 1 the Indiana, Columbus & Eastern Railway, a system which compares quite favorably with some of the big steam systems, commenced operation. This corporation embraces all the roads in Ohio recently acquired by the so-called Widener-Elkins syndicate, and includes fifteen scattered city and interurban properties with nearly 600 miles of track. Each road was formerly operated by its own petty staff of managers, engineers, superintendents, and numerous other officers, but all are now amalgamated into one large railway system with a central operating office, divided into sections under division superintendents but with one engineering force, one auditing force and one traffic department.

The Indiana lines of the Widener-Elkins syndicate, some ten in number, have up to this time been grouped together under three managements, but it is understood that these also are soon to be brought together under one head, forming a system somewhat larger than the Ohio system mentioned. It seems probable that as soon as these plans have been perfected the properties in the two States will be consolidated into one, forming a traction system of some 1500 miles, with a total capitalization of around sixty millions of dollars, a sys-

tem which will touch nearly every important city and village in the two States. Incidental to these merger plans is the interesting announcement that fine traction terminal stations similar to the one in Indianapolis are to be erected in Columbus, Dayton and Toledo. Adequate and convenient terminal facilities were never provided by the steam roads until they got together and joined interests, and here again history repeats itself.

From Cleveland comes the report that the Everett-Moore syndicate has fully recovered from its embarrassment, and with the aid of Eastern capital it has now not only regained nearly all the properties which it lost at the time of its failure four years ago, but it is acquiring additional links and is soon to announce a merger of traction properties into one big system which will equal if not surpass in importance that in Central Ohio and Indiana. Considerable progress has been made in this direction. The Detroit United System, including lines recently acquired, now embraces some 650 miles, while the roads in Northern Ohio, already grouped together under a community of interests, and others that will doubtless be picked up ere the consolidation goes into formal effect, will mean a system of nearly 2000 miles. It would mean the magnificent city systems of Cleveland, Toledo, Detroit and several smaller cities, and a chain of high-speed interurban roads that would reach from New York to St. Louis if stretched into a continuous line.

And as if to emphasize the weakness of the individual small road and the urgent need for combination of interests, there is the almost simultaneous announcement this week of the failure of two important independent lines, one in Ohio and the other in Indiana. Both of them were supposedly strong, promising propositions and capable of great development. They failed because of lack of capital to tide them over a short period of pressing need, and will undoubtedly pass into stronger hands and become amalgamated with other big systems.

The Three-Cent Fare Heresy Again

As we noted last week, Cleveland is having another session with the cheap-fare banshee that seems to have become a sort of municipal retainer, periodically howling about as a preliminary to the demise of its hopes. It has come to pass that a cheap-fare road may actually at last be built and operated in Cleveland on what one may call an idealistic basis for rapid transit. There has been so much fruitless talk pro and con that it is really a relief to feel that at last the theory may be tried and its merits once for all determined. Its promoters and the other fellows can hardly be expected to agree even upon statistics, so that it is in no wise surprising to find widely different views as to the probable result. The new company proposes to start with clean books, to build for cash obtained by the sale of cumulative 6 per cent stock, and to operate for profit if it can find any upon a 3-cent basis. If cheap fares cannot be made to pay under this method of financing, they cannot be made to pay at all. It is often claimed, sometimes with reason, that many roads are to-day successfully paying interest charges on the capitalized mistakes of a decade or more. If this be so, then a road starting without any mistake save too low fare may have a fighting chance for profit. On the other hand, a three-cent fare means reducing the gross receipts per passenger by one-third, which is an enormous decrease of price for any business.

Most electric roads to-day operate on 60 to 70 per cent of their gross receipts based on about 4½ cents net per passenger. If these receipts are cut down by one-third the chances of paying operating expenses and leaving anything to the good are certainly precious slim. The best that can be said for the three-cent fare proposition on the basis of the general data is that it lies in the debatable ground between success and failure, with its only hope resting on a short road, no transfers, and an altogether abnormal density of traffic, not reasonably to be expected under our usual American conditions. On the basis of the published statements of the promoters of the new company, it can secure estimated gross receipts of $288,000, but this is possible only by carrying more than 9,000,000 passengers annually upon 10 miles of track worked on ten-minute headway. This is a stiff proposition even for a promoter to justify, being something like 115 passengers per trip steadily during eighteen hours of daily service. In view of this we would meekly suggest that the case of the new company is a good one for trying the no-seat-no-fare theory in a practical way. Looking at the case from the viewpoint of the opposition, an engineer quoted in our article last week estimated the cost of operation on the basis of five-minute headway, which would seem to be necessary to decent earnings, at a little over $100,000 per year, which calls for 3,333,333 passengers per year merely for operating expense, and this is probably conservative. This load there is certainly reasonable expectation of getting, but where do the profits come in? And how about depreciation? On the estimated cost of the first ten miles of road another million passengers must be added to pay the expected 6 per cent, and if anything suitable is charged off for depreciation, still another million

To be perfectly fair, we admit that there are few electric roads which set aside 6 per cent for depreciation. Too many of them trust in Providence and keep depreciation executing a double shuffle in the bookkeeping department until it is time for another bond issue. But in starting in to demonstrate the sufficiency of a three-cent fare one may well face the depreciation question, for it will certainly come in the form of wholesale replacements long before the expiration of the twenty-year franchise. The fact is that the semi-socialistic element seldom realizes the financial straits in which many street railway properties have been—it sees only the prosperous roads, some of them undeniably over-capitalized but flourishing because the community flourishes; or the partially successful roads keeping up a brave front and trusting to the growth of the country to pull them through the slough of depreciation, while putting all the available surplus into extensions. If one looks back and pictures to himself the dreary wastes of outlying dust and mud now converted into prosperous suburbs by the street railways that took long chances and pulled through, he will realize what the uniform five-cent fare has done for the country. Many a line has kept its nose above water on the difference between five cents straight and six tickets for a quarter, which is, if one stops to think of it, a considerable margin in reckoning a few million fares a year. We shall watch the next stages of the proposed Cleveland experiment with keen interest.

THE NEW PUBLIC SERVICE BUILDING OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY

The policy of establishing terminal stations for interurban electric railways is becoming more popular, but the Milwaukee Electric Railway & Light Company is certainly the first to combine, in a large city, the two features of a commodious terminal station for its interurban service and an office building devoted exclusively to the needs of the company. But the structure erected by the company is interesting and unique in other ways than its size and uses. It is noteworthy even in this age of magnificent buildings for the attractiveness and taste of its architecture, the beauty of its interior decoration, and the thoroughness of all of its appointments. Some idea of its character will be had from the fact that, besides comprising an office building for all of the offices of the company and a terminal station with all the requirements for passengers, it also contains dining rooms, machine shops, physical and chemical laboratories, a convention hall, and when fully completed a 4500-kw generating plant will be installed in the basement.

THE RECENTLY COMPLETED PUBLIC SERVICE BUILDING OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY, AT MILWAUKEE

The care with which each detail has been arranged will be appreciated from the statement that throughout it has been constructed under the personal direction of John I. Beggs, president and general manager of the Milwaukee Electric Railway & Light Company. It has been fitly named the Public Service Building, as it is the headquarters in Milwaukee for the electric lighting, public heating and transportation services upon which the welfare of the community depends in such large measure.

It occupies the entire block bounded by Sycamore, Second and Third Streets and Everett Street, and measures 200 ft. x 300 ft. It is of steel framework construction. The columns are encased in concrete and rest on concrete footings which are carried by piles. While the building is at present four stories high, provision has been made in the strength of the columns and the manner in which they are carried through the roof, for an additional height of eight stories whenever the growth of the company's business demands. The basement and the first floor of the building cover the entire block, but the three upper stories are broken by three light courts 20 ft. wide which extend from the rear and are carried about three-fourths the depth of the building dividing the rear of the building into four wings.

The exterior of the building is shown in one of the accompanying engravings, and presents a very pleasing appearance. For the first story, the trimmings and cornice are of Bedford stone, while the main body is faced with warm gray Norman brick. The appearance of the structure as a whole is heightened greatly by the hammered copper cresting which surmounts the cornice. The main facade on Sycamore Street is flanked by two pavilions carrying ornamental balustrades and canopies. This facade is further ornamented by the carved stone work carried up to the third story about the main entrance, midway between the two pavilions.

The rotunda just inside the main entrance, which is carried up two stories and finished entirely in marble, is one of the most ornate portions of the building. The walls, which are of the lighter shades of Sienna marble, obtained from an old convent quarry in Italy, are enriched by a frieze of panels of Swiss Cipilino. The main entablature and balustrade surrounding the rotunda at the second floor level are carried by a series of Doric columns of white Italian marble. In the second story, immediately above, are an equal number of Ionic columns of similar marble. The ceiling of the rotunda is highly ornamented with stucco, and from its center will be suspended a large electric chandelier of attractive design. In the main entrance to the left of the entering doors are the two elevator shafts, which are provided with grills of Tiffany bronze.

Directly opposite the entrance doors is the main stairway, which, branching in opposite directions at an intermediate landing, reaches the second floor near the entrance of the theater on one side and at the entrance to the auditing department and the club quarters of the men on the other. This stairway and that reaching the third floor are provided with a balustrade of white Italian marble, while the treads and risers are of Joliet limestone. A narrower stairway, reaching the fourth or top floor, is provided with a balustrade of Tiffany bronze of a very ornamental design.

The floors of all the corridors above the first story consist of slabs of Joliet and godfrey gray limestone with borders of rouge royal and dark Tennessee marbles. The walls of the corridors on the second and third floors are finished with a wainscoting of white Italian marble, while the finish of the fourth-floor corridors is in light gray Tennessee marble.

The interior woodwork of practically the entire building is of birch. In fact, the only exceptions are the suite of the president and general manager, which is paneled of fumed oak, and the directors' room finished in solid mahogany. The desks, tables, and practically all the furniture in the building were built on special order and are of the same material as the interior finish.

While the architectural and general structural details of the building have been given very close attention, the engineering features probably received even more consideration. This would naturally be expected, since the construction of the building as a whole was under the supervision of an engineer having at hand a corps of engineers who were to be the future occupants of the building.

A great deal of attention was given to the question of lighting, both natural and artificial, and the building is a good example of the most approved ideas in what is now known as illuminating engineering. The light courts already referred to and the general arrangement of the rooms obviate the use of artificial light during the day in all parts of the building with the exception of the basement and a few closets. Artificial lighting is by electricity alone, and quite a series of

MAIN ENTRANCE TO THE BUILDING

tests were conducted by O. M. Rau, superintendent of the electric lighting department, and his assistant, F. A. Vaughn, electrical engineer of this department, in order to arrive at the best method to be followed. The method finally decided upon is in line with the best knowledge on the subject, that of providing an even distribution of light rather than concentrating lights in central chandeliers and giving a surplus of light in some places and dark corners in others. With very few exceptions all portions of the building are lighted by individual incandescent lamps suspended about 3 ft from the ceiling by brass electroliers. These electroliers are fitted with the new General Electric metallized filament lamps of 50, 75 and 100 cp, the intense glare of the filament being destroyed by frosting the lower portion of the bulb. Each of the electroliers is fitted with either a class C or a class D Holo-

INTERIOR OF MAIN ENTRANCE TO THE BUILDING

phane reflector, the former over desks where a concentration of light is desired, and the latter where general diffusion is wanted. The lighting of all the offices was figured out on a basis of 2 candle feet at the desks, and practically the same basis was used in the lighting of the corridors, toilet rooms and other portions of the building. In several portions, for example, the theater and the directors' room, an ornamental effect rather than equal distribution was desired, and here some pleasing modifications in the method of lighting were followed.

FIRE PROTECTION

Although the building is of fireproof construction, careful attention has been given to protection against local fires in any portion of it. Hose racks with standpipe connection are located at convenient points in the corridors and other places, and the car sheds, freight elevator shafts, and basement door openings are provided with automatic fire doors. The car sheds store rooms and the stage of the theater are fitted with automatic sprinklers, a total of 2000 Grinnell sprinkler heads being installed in the building. These heads are all connected to tanks each having 10,000 gallons capacity, in the basement, in which the pressure of the city mains is maintained by a 6-in. electrically driven two-stage centrifugal pump. A check valve keeps up the pressure in the storage tank in case the pressure in the city mains falls. In event of an emergency the storage tank just referred to may be connected to the two 10,000-gallon tanks used for the

storage of spring water, and the contents of these may be discharged through the sprinkler system. The stand pipes are connected to the city system by two 6-in. mains which enter the building one at the east and one at the west end.

DRINKING WATER SUPPLY

Throughout the building are drinking fountains supplied with water from the Waukesha springs. The piping system connected with the fountains centers in two concrete tanks in the basement, each of 10,000 gallons capacity. Water from the springs is hauled to the building in tank cars and is discharged from these into the tanks, and pumped through the building by two motor-driven centrifugal pumps. The water in the system is kept at a temperature of about 40 degrees by coils from an ice machine in the basement.

TOILET ROOMS

The building is well supplied with toilet rooms, and there is a total of about 100 wash basins. All these rooms are finished in Tennessee marble. The wash basins are of special design to prevent water splashing out over the sides; this design was one of the many details of the building to which Mr. Beggs gave his personal attention. The plumbing and piping in all of the toilet rooms has been so arranged that any part of it may be gotten at for repairs without removing or disturbing any of the permanently installed fixtures.

VAULTS

The arrangement of the fireproof vaults with which each office is supplied is somewhat out of the ordinary. They occupy eight separate shafts which extend from the footings of the building to the roof. The shafts are provided with floors of concrete slabs and doors built by the Cary Safe Company. All of the book sheives and filing cases in the vaults are of metal.

ELECTRIC CLOCKS

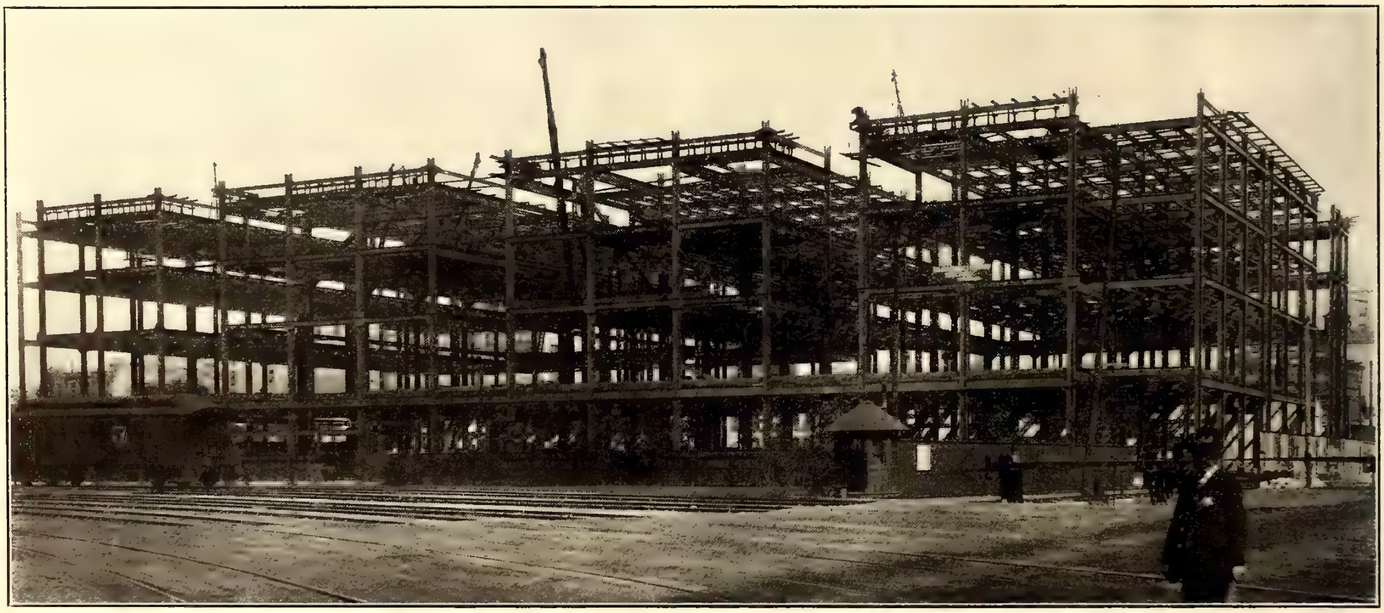
In the several offices and corridors of the building there are placed about forty electric clocks, which are operated in synchronism with a master clock located in the telephone exchange room. One of the clocks is placed over the main entrance to the building, another is mounted over the main stairway from the first floor, while a third, which is of unique design, is located in the room of the private secretary to the president and general manager. This latter clock is placed in a panel with carved figures representing industry and time on either side.

PNEUMATIC TUBE SYSTEM

The transmission of reports, specifications, and documents of various kinds between the different departments is greatly facilitated by a Lamson pneumatic tube system which centers in a room on the second floor of the building and connects with twenty-one terminal heads in the various offices. The system is operated with compressed air from tanks in the basement, and the electrically controlled valves are supplied with current from storage batteries in the telephone exchange room. Each of the cartridges in which the papers are carried has printed upon it a directory of the offices in the building. When a person wishes to transmit a document to a distant department he turns an indicator on the cartridge to the number of that department as shown by the directory, and slips the cartridge into the tube. It is received in the central tube room by an operator who sends it on to the department indicated. By means of this system a document can be sent to the most distant part of the building and can be signed and returned in about one minute.

TELEPHONE SERVICE

The provisions for telephone service in the building also received the attention of the electric lighting department which has charge of the telephones of the dispatching system. The Strowger automatic system is combined with the Bell system. A telephone room on the second floor contains an automatic exchange as well as a manual switchboard for the building and a despatcher's board. In an adjacent room is installed a storage battery with a motor generator which is used in connection with the telephone system, while quite an elaborate marble switchboard for all the low-voltage electrical apparatus in the building is installed in the partition between the rooms. There are at present about 100 telephones installed throughout the building. The wires are carried in conduits to distributing points on each floor, thence they extend under the floor and are brought up at points where desks are at present located or where they may possibly be located in the future. In some of the rooms these outlets are placed at intervals of about ten or twelve feet, so that no matter where a desk may be placed telephone connections can be obtained without difficulty. Desk telephones of the Strowger automatic system are employed, but are fitted with Bell transmitters. Each telephone is provided with a key which permits the use of the manual or of the automatic



A VIEW TAKEN OF THE STEEL FRAME WORK OF THE BUILDING FROM THE REAR

exchange at will. The manual board is interconnected with the despatcher's board, so that any of the offices may be given connection with the booths of the despatcher's system out on the interurban lines. Connections are also made with the city telephone system and with long-distance telephones.

In some of the departments a rather unusual arrangement is carried out by having what might be termed branch exchanges. While calls may be sent out from any telephone in the department, all calls are received at a central desk where the nature of the business is determined and connection then given to the proper party.

WIRING

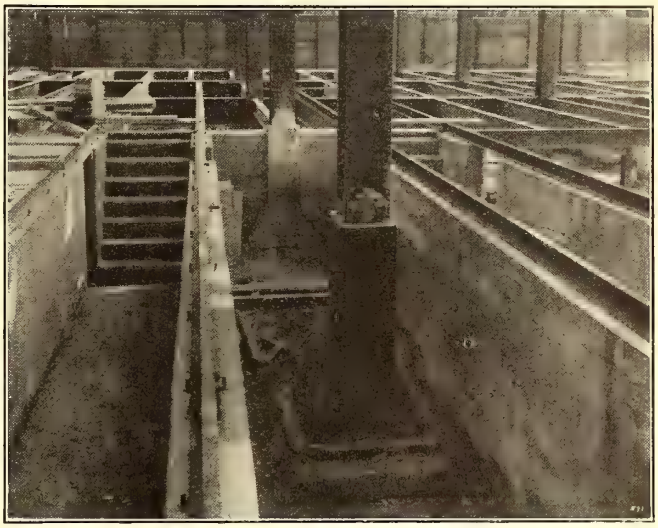
All the wiring for the lights, power, telephones, clocks, and pneumatic tube system is inclosed in iron conduits embedded in the concrete floors and carried between the separate floors in shafts. The wires to each floor are run to central switchboard cabinets containing the switches for the lights and motors and the terminals for the low-voltage wires. The switchboards, which were built by the electric lighting department, are equipped with a combination fuse and switch designed by Mr. Rau, which is so built that the enclosed fuses form the switch blades and thereby save the space usually taken up by the fuse bases. The switchboard in the basement contains a separate lighting panel for each floor of the building, and in addition one panel of all the power circuits. The lighting panels are provided with both a. c. and

TELEPHONE ROOM, SHOWING DESPATCHERS' BOARD AND CENTRAL EXCHANGE FOR BUILDING

d. c. buses. Two feeders to each floor leave the separate lighting panels, one feeder going direct to a cabinet in the east end of the building, while the other reaches a cabinet in the opposite end. Other feeders connect the two cabinets with a third, forming a loop circuit, so that in the event of failure of one of the feeders the other can be used to light the whole floor. The wiring also permits current from either the d. c. or a. c. bus-bars to be supplied to each separate floor.

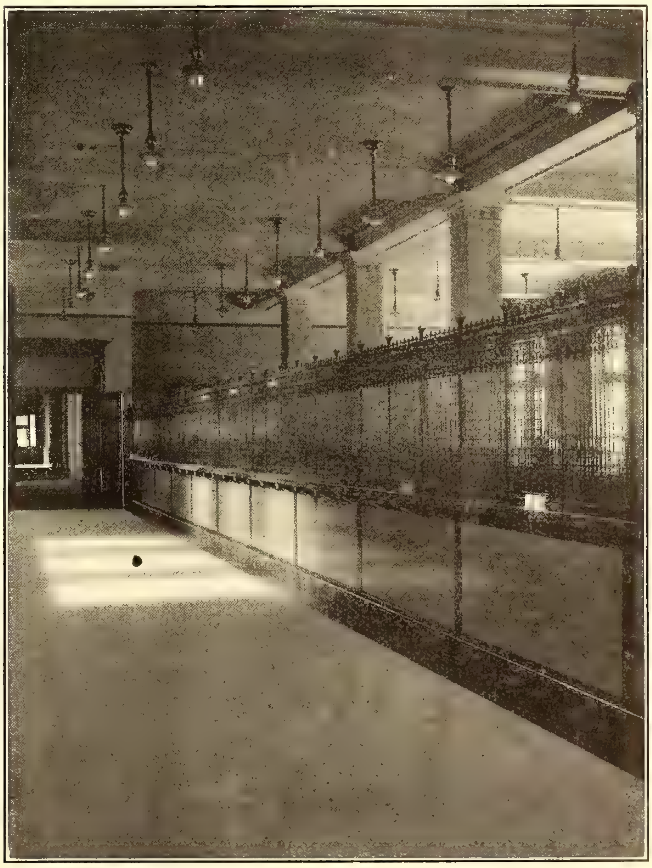
VACUUM CLEANING SYSTEM

A cleaning system consisting of a system of piping extend-



VIEW OF CAR SHEDS DURING CONSTRUCTION, SHOWING CONCRETE PITS

ing to all parts of the building, and two steam aspirators in the basement for producing a vacuum in the pipe system is

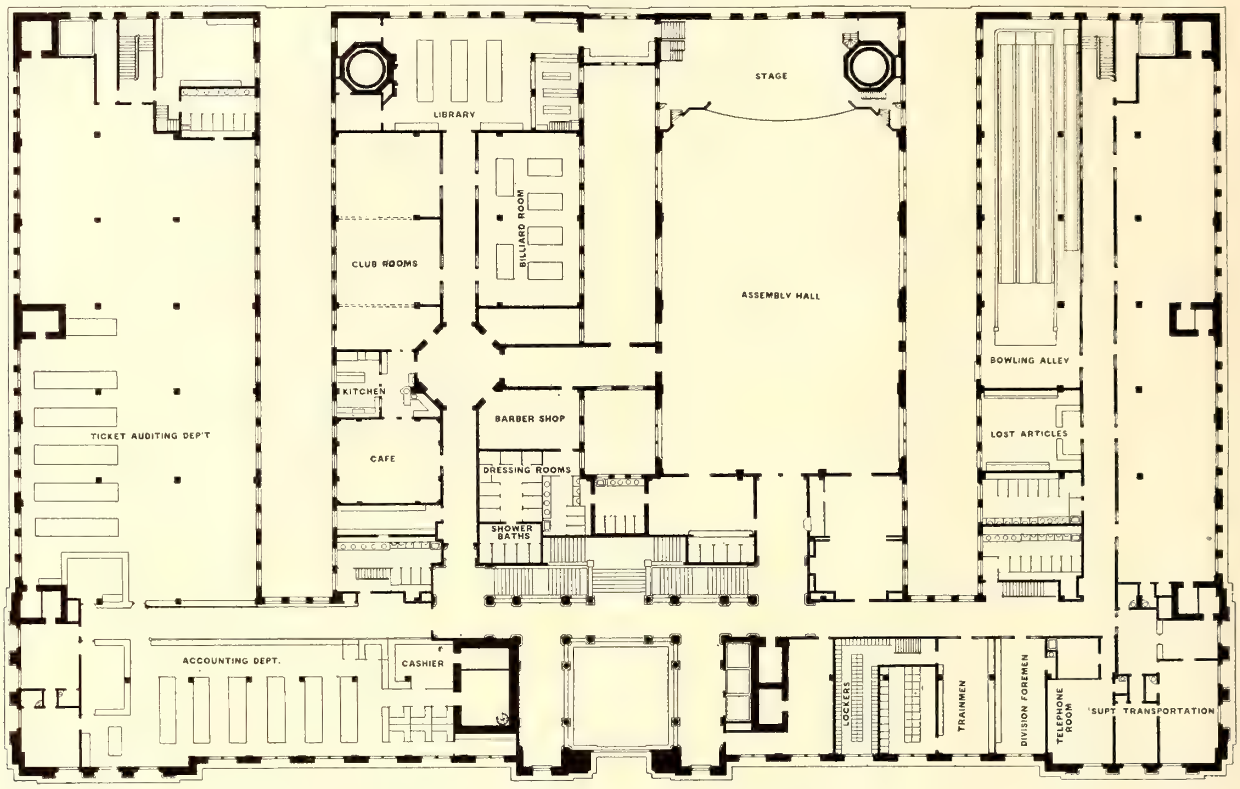


VIEW IN THE ACCOUNTING DEPARTMENT, SHOWING THE METHOD OF LIGHTING, AND MARBLE COUNTER SURMOUNTED BY GRILL

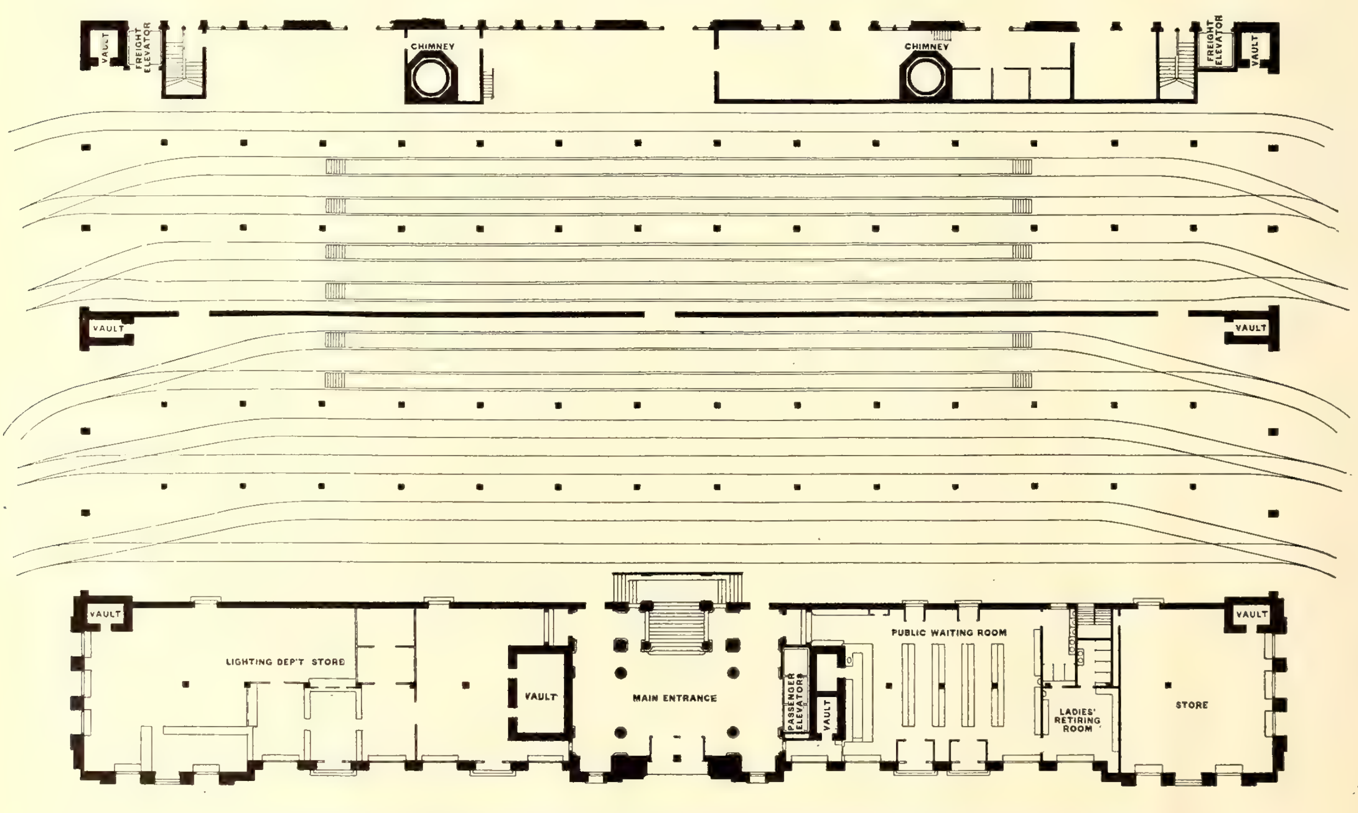
installed. The outlets are at such intervals that all portions of the building can be reached by hose of convenient length, and enough tools and apparatus is provided to keep twenty janitors at work. The system was installed by the American Air Cleaning Company, of Milwaukee.

PASSENGER WAITING ROOM

Practically all the ground floor of the building is devoted to a central car house and terminal station for the interurban and suburban lines. The front portion east of the entrance, however, is used by the electric lighting department as a salesroom and display room, is fitted with marble counters, and is provided with closed cabinets in which supplies are kept. The public waiting room just west of the main entrance, which is finished in Tennessee marble, has in connection with it a retiring room for ladies and proper toilet facilities. Along the east wall are a lunch counter and cigar stands. The counter is of Tennessee marble to match the general finish of the room, while the cigar cabinets are zinc lined. The waiting room opens directly out into the car sheds, which, containing six tracks, extend the full length of the building and connect with the car tracks on Second and Third Streets. The repair sheds, which are separated from the car sheds by a brick wall, contain five similar tracks.



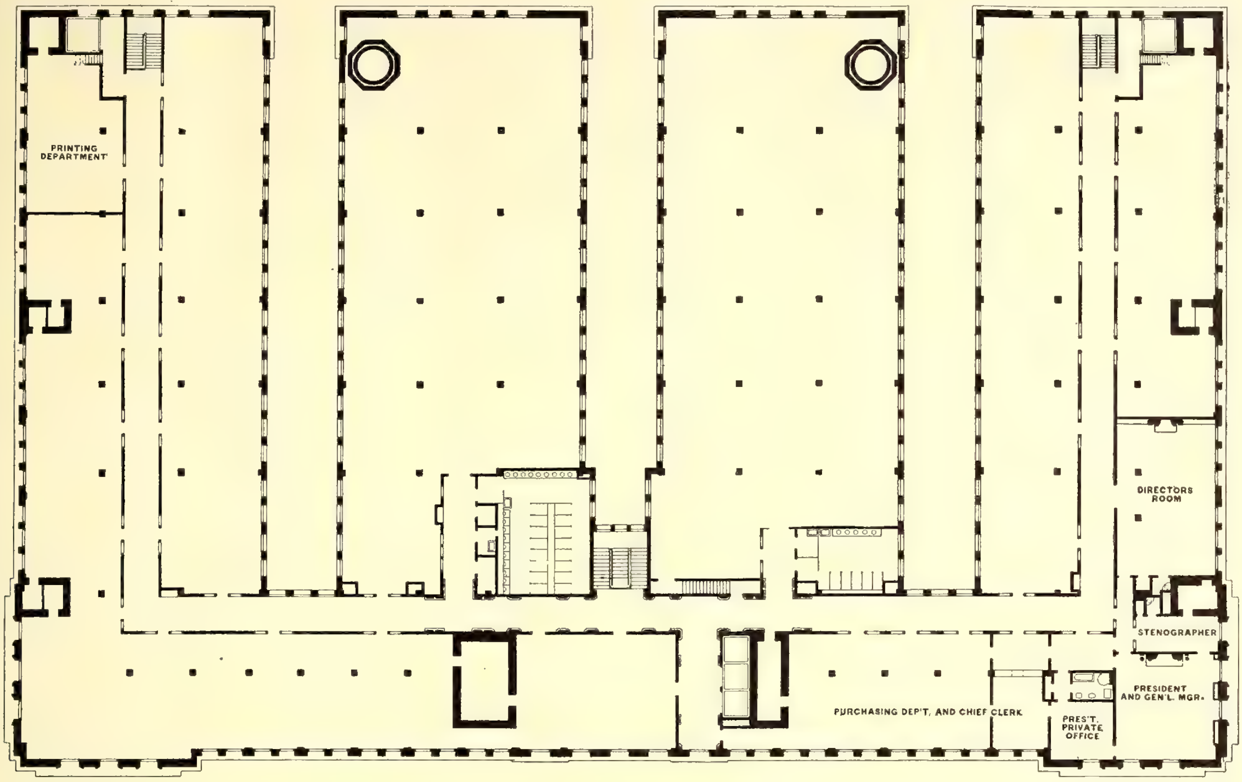
THE SECOND FLOOR OF THE MILWAUKEE PUBLIC SERVICE BUILDING, SHOWING LOCATION OF VARIOUS DEPARTMENTS AND RECREATION FACILITIES FOR THE EMPLOYEES



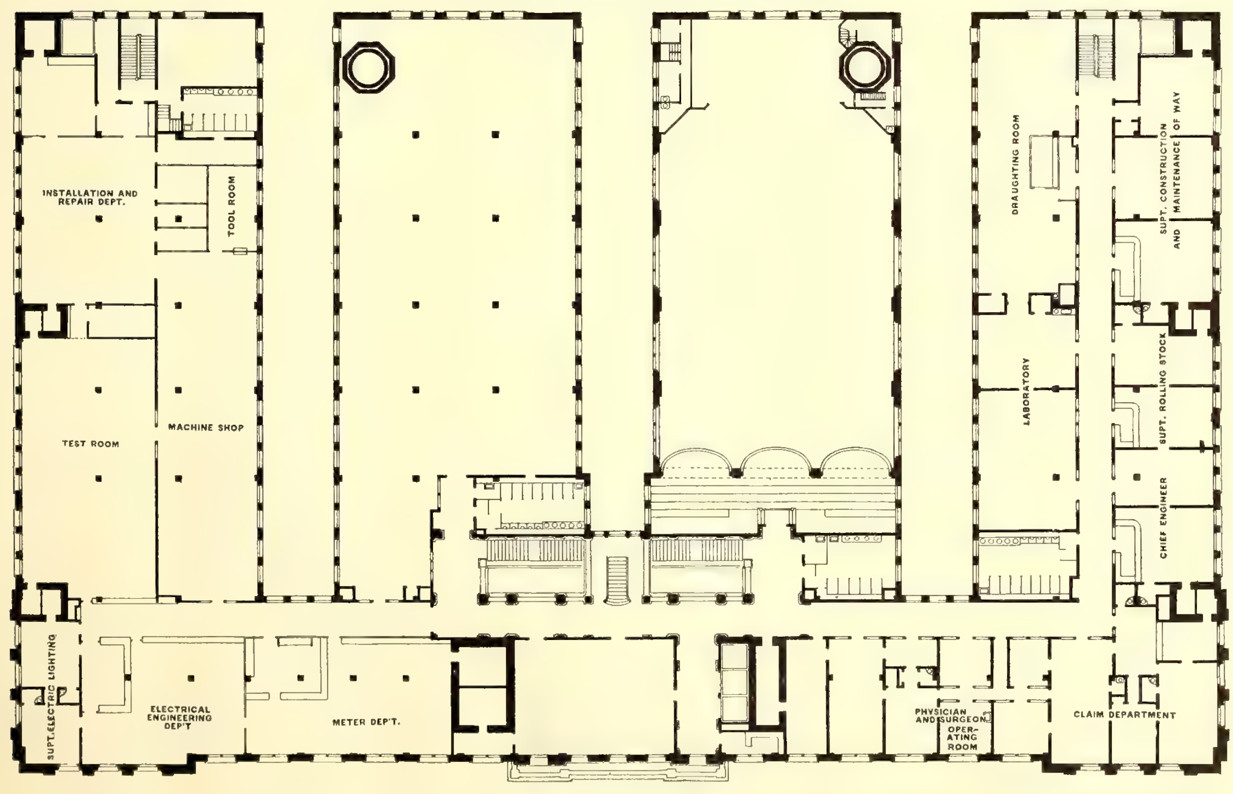
PLAN OF THE FIRST FLOOR OF THE MILWAUKEE PUBLIC SERVICE BUILDING, SHOWING ALSO THE TRACK LAYOUT

TRACKS AND PITS

The floors of both compartments are of reinforced concrete, while the pits under the two southernmost tracks in the car sheds and also under four of the tracks in the repair shop are of concrete construction, and slope to a drain at one end connected with the sewer. The pits, moreover, are heated by coils of pipe along one side and are lighted by incandescent lights wired in iron conduit. The lights are placed in recesses in the cement just under the rail, these recesses being so shaped that the walls act as reflectors for the lamps. The space along the south wall of the repair shop will be utilized for the few machine tools required and by the emergency repair crews. Only the washing and cleaning, oiling and light repairs will be done in this shop. For general repairs the cars will be sent to the central shops of the company. The car sheds are as well lighted as the construction of the building above would permit. The bottoms of the light courts above are all provided with either sidewalk lights or skylights



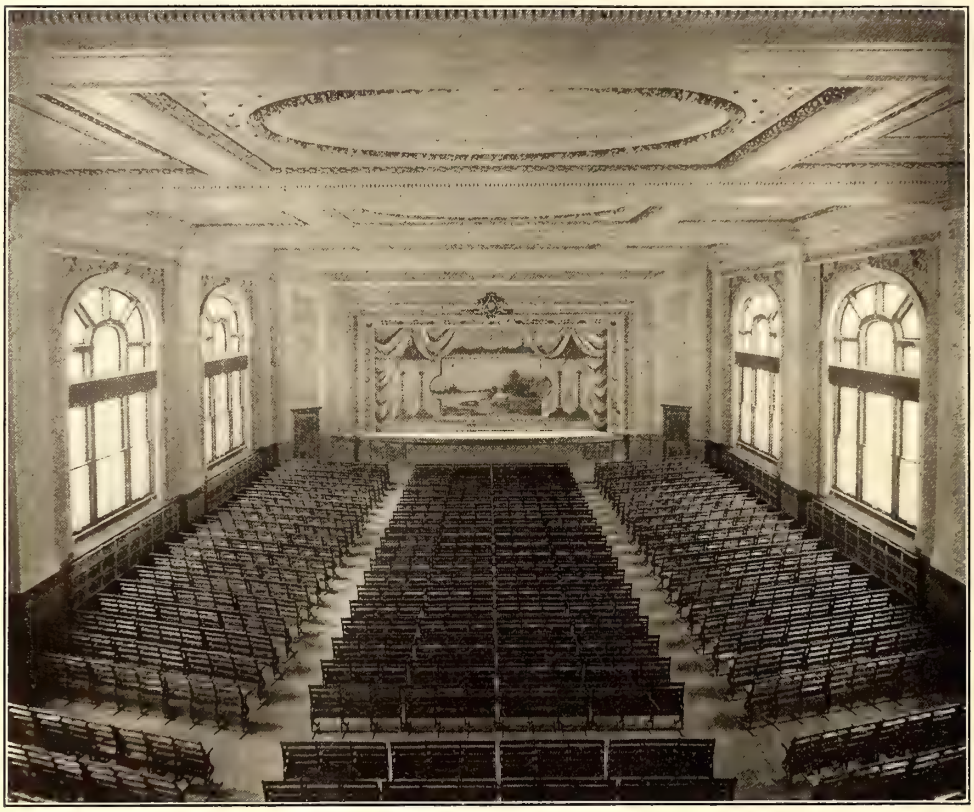
THE FOURTH FLOOR OF THE MILWAUKEE PUBLIC SERVICE BUILDING, ACCOMMODATING THE OFFICES OF THE PRESIDENT AND GENERAL MANAGER



THE THIRD FLOOR OF MILWAUKEE PUBLIC SERVICE BUILDING, COVERING MACHINERY TESTING, MEDICAL, LEGAL AND CLAIM DEPARTMENTS

of the usual type. Artificial light is supplied by individual incandescent lamps supported a few feet from the ceiling by brass electroliers.

One of the most interesting features of the car sheds is the type of door closing the openings through which the cars enter the building. These doors were designed by E. W. Olds, superintendent of rolling stock. They are double and hinged together in the usual manner, but the door as a whole is hung on a 4-in. gas pipe which projects down into the floor and up into the concrete construction above and is supported on roller bearings. A steel framework bolted securely to the gas pipe carries the door proper. This construction prevents the door twisting and adds to its strength. The upper portion of the door is provided with glass fitted in metal sash.



THE CONVENTION HALL WITH STAGE

TRAINMEN'S QUARTERS

A stairway from the car house leads to the trainmen's quarters on the floor above. These rooms are adjacent to the offices of the superintendent of transportation, which occupy the northwest corner of the second floor. The headquarters of the division foreman, to whom the trainmen report, is provided with a counter and windows for each foreman. Behind this room is another provided with desks fitted with glass compartments and used by the trainmen when making out reports. A gallery above and a portion of the main floor in an adjacent room contain about 300 metal lockers for the use of trainmen, and toilet rooms of ample size are located on the opposite side of the corridor.

ACCOUNTING DEPARTMENT

The auditing and accounting department occupies the east half of the front portion of the building and also the east rear wing. For almost the full length of the front room the counter of St. Anne Italian marble is surmounted by a lacquered brass grill behind which the working force is located. The offices of F. J. Voehn, assistant secretary and treasurer, are in the northeast corner of the building. The cash vault in this department is equipped with an electrical system of vault protection which when the vault is disturbed sounds alarms both in the building and outside at either end. Tickets and transfers are counted in the east wing, where a large force of girls is kept employed for this purpose.

TRAINMEN'S CLUB ROOMS

It was the intention that the building should serve more or less as a social center for all of the employees, and to this end club quarters were provided. These rooms take up all of the east central wing on the second floor. A corridor down the middle of this wing leads to the library in the rear, while about midway of its length is a small rotunda with doors opening into the dining rooms, barber shop, and billiard rooms. Two dining rooms are provided, with a kitchen equipped with facilities for cooking both by electricity and by gas and with refrigeration from the ice machine in the basement. At one end of the library in the rear is a large fireplace, while directly opposite is the library, which is in an enclosure fitted with metal book shelves. In addition to reading matter of a general nature, the library will be well sup-

A CORNER IN THE DIRECTORS' ROOM, SHOWING THE RICH CARVINGS, ORNAMENTAL FIRE-PLACE, MANTEL, ETC.

plied with technical books and magazines. The bowling alleys, which are included in the club quarters, are located in the south half of the west wing, and contain three alleys of regulation size and one pony alley. The lost article department is located in a room near the bowling alleys. Against the walls of this room are built closed cabinets reaching to the ceiling, so that articles may be kept in a systematic manner.

CONVENTION HALL

The convention hall takes up all of the first and second floors of the west central wing. The hall, which has a total seating capacity of about 1200 people, has a stage as fully equipped as that of a modern theater. The asbestos drop curtain with which it is supplied and the several others in use are raised by motors. Globes of three different colors are employed in the stage lighting, those of each color being wired in separately controlled circuits through a dimmer of the type usually found in theaters.

VIEW OF PUBLIC OFFICE OF THE PRESIDENT AND GENERAL MANAGER, TAKEN BEFORE THE INSTALLATION OF THE LIGHTING FIXTURES

MEDICAL DEPARTMENT

The medical department, in charge of Dr. C. H. Lemon, occupies five rooms on the third floor, fronting on Sycamore Street. These rooms were fitted up in a very attractive manner with the idea of encouraging men when injured to go to the company's physician rather than to an outside doctor. The walls and floor of the operating room are of Italian marble, while all of the apparatus in it is the most modern and most sanitary obtainable. The apparatus includes a standard set of American sterilizers, an operating table, dressing table, and instrument stands, all of white enameled steel.

OFFICES OF DEPARTMENT HEADS

The west wing of the third floor contains the offices of C. J. Davidson, chief engineer; of Fred G. Simmons, superintendent of way, and of E. W. Olds, superintendent of rolling stock. Across the corridor from the office of the chief engineer are the laboratories belonging to the mechanical engineering department, which, when finished, will contain machines for testing concrete, oils, coal and other materials used by the company. In the rear of the laboratories is the general draughting room for all the departments.

The electric lighting department is located on the third floor in the eastern portion of the building. In the northeast corner are the offices of O. M. Rau, superintendent of this department, and also of the electrical engineering department. The large room between Mr. Rau's offices and the central corridor of the building is used as a working office by the electrical engineering department and by the meter department, both of which are under the immediate supervision of F. A. Vaughn, assistant to Mr. Rau. The publicity department, conducted by Roscoe Moon, also has its quarters in this room. The section, devoted to the meter department is provided with racks for the storage of tested meters, and a portion partitioned off in which the meter readers, inspectors and installers report.

The testing department is just south of Mr. Rau's offices, and contains, among other apparatus, quite an elaborate testing board. One side of this board, which consists of a high panel carrying instruments and switches with a bench on either side, is used for testing of a general nature, while the other side is utilized for testing meters alone. One end of the board has facilities for testing the telephone apparatus, including that of the automatic telephones. The testing department will also be supplied with a six-phase motor generator set from which different frequencies and phases of current may be obtained, while a separate room has been reserved for photometric tests. Just north of the test room is a shop which is devoted largely to the manufacture of switchboards and electrical apparatus. This shop contains a full equipment of machine tools, including turret lathes, milling machines, drill pressers and grinders., In the basement is installed a large radial drill belonging to the shop equipment, which is used exclusively for boring switchboard panels. All of the separate tools in the shop have individual motor drive, the motors in most instances being mounted on the machines.

INSTALLATION AND REPAIR DEPARTMENT

At the rear of the test room is the installation and repair department, and opening from the large central room devoted to general work are several small ones used for different purposes. One of these contains electrically driven arc light globe washers and electro-magnetic carbon cutters. Another is equipped with several grinders and buffers used in finishing switchboard and other brass and copper work. This room is provided with an exhaust fan having tubes running to each machine. Near the rear of the building is a locker and toilet room for the employees in the shop. A freight elevator in the southeast corner of the building handles all heavy work going into and out of the shop, as well as electric meters.

In a single room near the southwest corner of the building on the fourth floor is located the printing department which prints the street railway transfers and rules, as well as all

the forms used by the company. The printing office is supplied with a Miehle 33-in. x 48-in. cylinder press, a two-color Harris automatic press for printing transfers and small forms, a double-decked ruling machine, job presses, stitching machine, perforating machine, and other machines for similar work.

PRESIDENT'S OFFICES

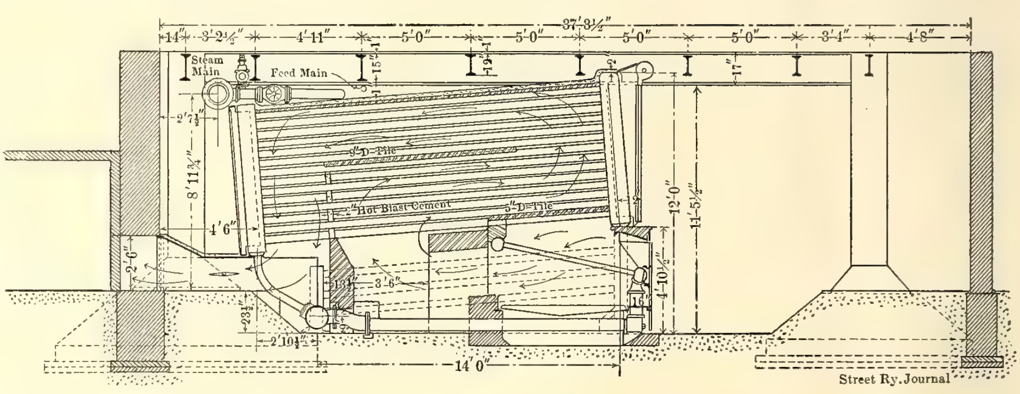
The offices of President and General Manager John I. Beggs, in the northwest corner on the fourth floor, are the most elaborately finished rooms in the building. The president's suite of offices consists of a reception room, a main office in the corner of the building, a private office to the east with a bathroom opening off from it, and a private secretary's room west of the main office. The walls of all these rooms are paneled to the ceiling in fumed oak, while the door casings are hand carved. The floors are of hardwood with a border of parquetry. The furniture, which consists of davenports and chairs upholstered in Spanish leather, book cases and desks, are of oak to match the general finish of the room. The ceiling is deeply paneled in stucco ornamented with gold leaf. Mr. Beggs' desks, a roll-top one and another with a flat top, occupy the central portion of the room. The most imposing feature of the room is probably the fireplace and mantel against the south wall of the room. The former is of marble and bronze and is provided with heavy fluted brass andirons. A clock which strikes the watches of a ship instead of the hours occupies a central position on the mantel, while ornamental electroliers are placed on either side. The office of the private secretary, adjacent, is provided with a vault for the storing of records, the metal files and cases of which were designed personally by Mr. Beggs.

A private passageway from Mr. Beggs' office leads to the directors' room just beyond the private secretary's office. This is an oblong room finished in mahogany. A paneled wainscoting is ornamented with hand-carved sphinx heads, while a mantel of imposing design takes up quite a portion of the south wall. Underneath the long central panel in the ceiling will be placed a directors' table, surrounded by Bank of England chairs. Just east of the offices of the president and general manager is the office of his chief clerk, E. B. Meissner, while the office force of the purchasing department under Mr. Meissner's supervision occupies an adjacent room.

THE BASEMENT

While the storeroom of the lighting department is located in the southern end, the greater portion of the basement is taken up by a power plant, elevator machinery, air compressors and refrigerating machines. A contract for furnishing steam to the Milwaukee Central Heating Company was primarily responsible for the installation of the power plant, which when completed will consist of ten 500-kw Edgemoor boilers and three 1500-kw Allis-Chalmers Parsons turbines. The limited amount of space available introduced several difficulties in the installation of the boilers, which are arranged in one row near the south wall of the building. Although of 500-hp, each boiler is installed in a space 12 ft. 9 ins. high and 16 ft. 5 ins. wide. An idea of the close work required to get the boiler in the space available may be obtained from the accompanying drawing showing the boiler installation. The boiler itself (not the setting, which includes the side tubes) was designed by the late William Sellen, while the setting was devised by C. J. Davidson, chief engineer of the system.

The boiler consists of a skeleton of tubes supported on legs connected by water tubes. These water tubes are provided with a fire-brick covering, and similar bricks enclose the tubes of the boiler proper. The lower tubes, together with the fire brick enclosing them, might be said to form the boiler setting, and consequently the space taken up by the usual brick furnace walls is saved. The limited head room made the use of a steam drum out of the question, and the steam is taken directly from the rear header of the boiler and only about 15 ins. above the water level. Immediately in front of the line of boilers and projecting out under the sidewalk is a space for coal storage, the coal being dropped through manholes in the sidewalk above. Two stacks built of blast furnace slag, each 150 ft. high and 9 ft. in diameter, serve the boilers. The stacks project up through the building, and special construction was carried out to lessen the heat radiation. Each is enclosed in a brick wall with air space between, the stock proper and the enclosing wall entirely independent of each other to allow for difference in



DETAILS OF BOILER SETTING

the expansion and contraction. The boilers are fed by two Worthington 14-in. x 8½-in. x 15-in. center-packed piston plunger pumps installed in connection with two 1500-hp Hoppes heaters.

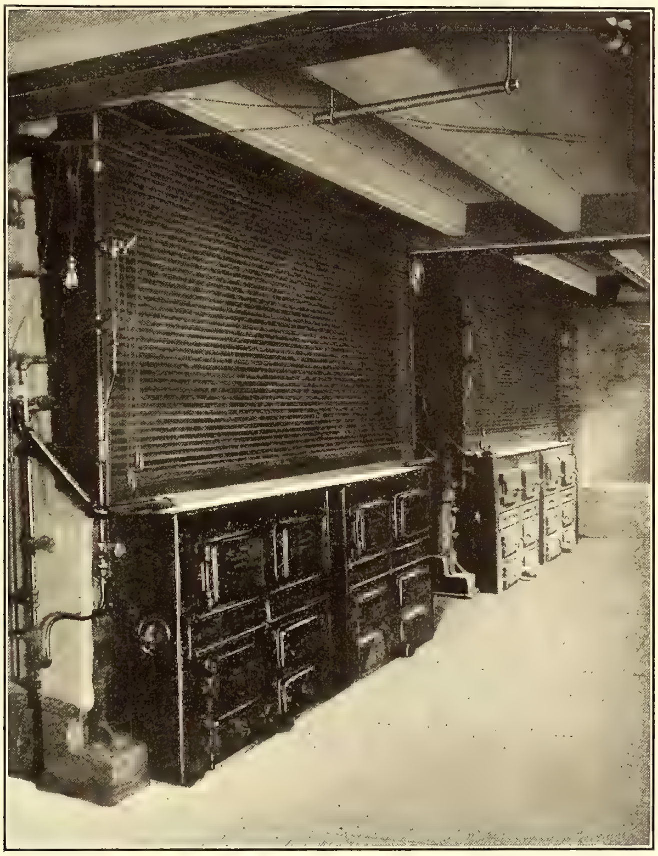
EXHAUST STEAM TURBINES

As power could be obtained at a comparatively low cost by passing the steam through engines before turning it into the heating mains leaving the building, the three 1500-kw turbines already mentioned will be installed in the central portion of the building. These turbines are specially constructed to operate non-condensing, and in fact, they will operate with a back pressure of 7 lbs. With this pressure, which is equivalent to 22 lbs. absolute back pressure, and with 150 lbs. pressure at the throttle, these turbines have a guaranteed consumption of 44 lbs. of dry steam per kilowatt-hour at three-fourths load, 40 lbs. at full load, and 41 lbs. at one-fourth overload. The generators driven by the turbines are of the Bullock type, 2300-volt, 60-cycle, three-phase, with an exciter mounted on the same shaft. Part of the alternating current generated will be sent out of the station without being transformed, but the greater portion of it will be supplied through two 1500-kw motor generator sets to the direct-current Edison system feeding the business district of the city. A storage battery installed in the basement is floated on the Edison system. The battery consists of 320 G-39 chloride cells, and is provided with end-cell switches and connections. Space has been left near the center of the

building for another battery of twice this size when the growth of the system demands. In connection with the battery there is installed a 150-kw booster set.

operated during the winter season when steam is required in the heating mains. For furnishing a summer load on these, provision has been made for the installation of two 100-ton

MOTOR-TESTING SIDE OF TEST BOARD IN TESTING ROOM



TWO OF THE 500-HP BOILERS IN THE BASEMENT

GENERAL VIEW OF MACHINE SHOP ON THIRD FLOOR, SHOWING INDIVIDUAL MOTOR DRIVE

The switchboard for all the electrical apparatus in the basement and also for lighting the building is located under the Sycamore Street side of the walk.

The boilers in the basement and the turbines will only be

steam-driven ammonia refrigerating plants, it being the idea to furnish refrigeration to hotels, cafes and other places of business in the immediate district. At present one 28-ton Vilter Manufacturing Company's motor-driven ice machine

is installed, which is used to cool the spring water in the tanks in the basement and to furnish refrigeration to the kitchen and the lunch counter in the waiting room. Two 150-ft. motor-driven Christensen air compressors are installed near the ice machine. These compressors maintain a constant air pressure in four tanks near by, which are used to operate the pneumatic tube system in the building, the pneumatic tools and the heat regulating system, and to open elevator doors. All the elevators are electrically driven, the machinery being located in the basement. The two passenger elevators are said to be the first drum-type, electrically driven elevators, and have a speed of 600 ft. per minute. They are operated by hoists manufactured by the Barth Manufacturing Company, and are built for 1500 lbs. load. Two freight elevators, one in each of the rear corners of the building, are built for 4000 lbs. and travel at 250 ft. per minute. In addition to the elevators mentioned there are also two sidewalk hoists and a hoist from the storeroom of the electric lighting department to the salesroom above.

PIPE SHOP

The basement also contains a shop for cutting, bending and threading pipe. All work of this nature for the entire system will be done in this shop, which is equipped with Bagnall & Keeler pipe machines, Baker tapping machines, and a pipe-bending machine.

DESIGN AND CONSTRUCTION

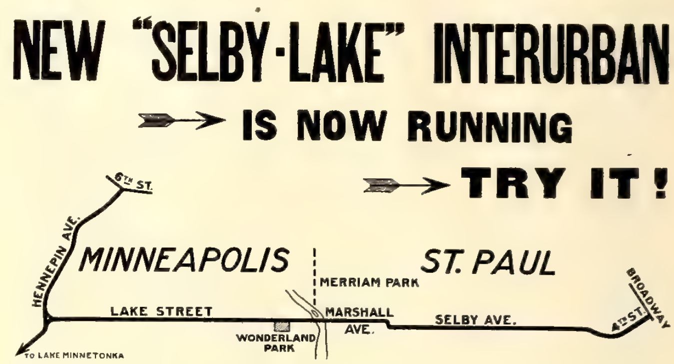
Throughout the design and the construction of the building Herman J. Esser, of Milwaukee, was retained as architect. All the detailed parts of the building, even to the desks, mouldings and furniture, were drawn up and submitted to Mr. Beggs for approval before being ordered, and it is due to the personal interest taken by Mr. Beggs in all the details of the design and construction of the building that it so well answers the purposes for which it was intended.

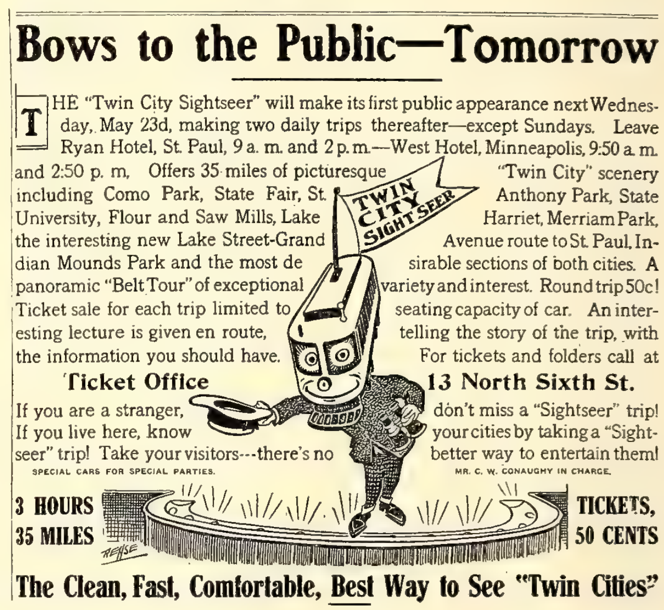
DEVELOPING PLEASURE TRAVEL IN THE TWIN CITIES

As announced in these columns recently, the Twin City Rapid Transit Company, operating the city and interurban systems in and about St. Paul and Minneapolis, has established a traffic-creating department in charge of A. W. Warnock, the company's first general passenger agent. Examples of the activity of this department are shown in the accompanying cuts, which are fac-similes of three newspaper advertisements to acquaint the public with new features in the service.

When the Twin City Rapid Transit Company opened a third interurban line between Minneapolis and St. Paul the fact was announced by half-page advertisements in the newspapers. The figures representing the city of St. Paul as a monk and Minneapolis as a good-looking, up-to-date young woman are typical of the two cities and well known as such by Twin City people. This new link is of special importance as it penetrates the most desirable sections of both cities. That the company believes in giving the public some hint of construction difficulties may be noted by its reference to a special device on the steep grade on Selby Hill in St. Paul. The grade on this hill is 16 per cent, and an equalizing device with the counter-weight system is required. A number of "tips" are also given with reference to other traffic matters of public interest. The cars for this service are 47 ft. long, 9 ft. 8 ins. wide, and seat 52 passengers. They are unusually roomy and comfortable. As they are products of this company's own shops the company feels particularly gratified with their beauty and excellence.

Coincident with the opening of the new line, the company is putting on its sightseer cars, the first of which includes a





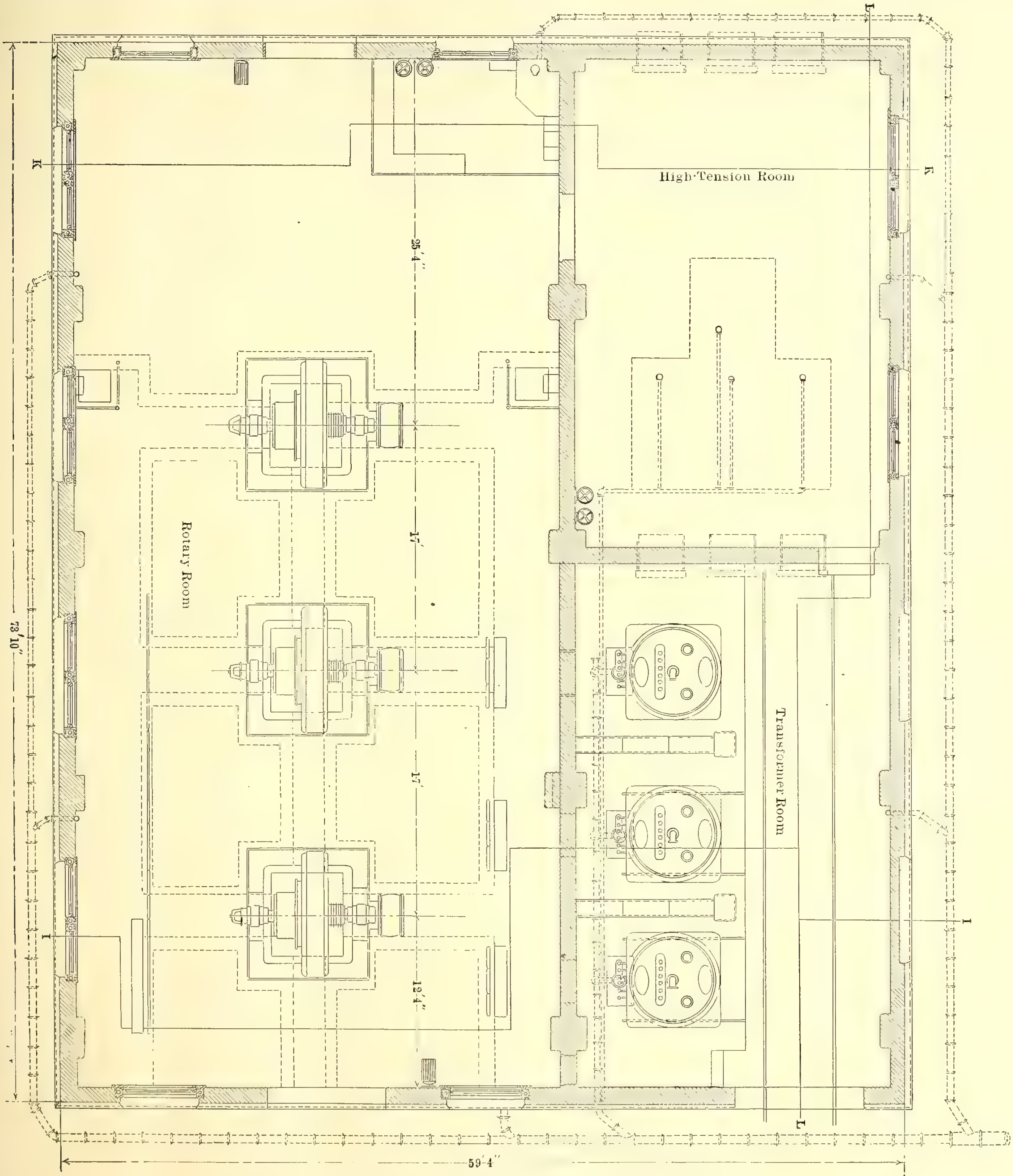
NEWSPAPER ADVERTISEMENTS OF THE TWIN CITY RAPID TRANSIT COMPANY'S NEW ROUTE BETWEEN MINNEAPOLIS AND ST. PAUL

panoramic trip of 35 miles in three hours for fifty cents. In addition to the newspaper advertisements the company also celebrated the opening of the new interurban line by placing large colored cards in all of its car windows.

THE 60,000-VOLT SUB-STATION AND TRANSMISSION LINE OF THE SYRACUSE RAPID TRANSIT COMPANY

The taking of 60,000-volt current generated at Niagara Falls into the city of Syracuse, exclusively for electric railway purposes, marks a noteworthy epoch in electrical development in the East. The transmitting distance is approximately 165 miles, and the Syracuse installation comprises one of the important plants in the comprehensive scheme now under way for supplying the central portions of New York State with hydro-electric power developed in the Niagara region.

The power delivered at Syracuse will be utilized by the Syracuse Rapid Transit Company for operating its traction system in that city. This system now comprises 80 miles of track, upon which the number of cars operated per day averages 85, and the number operated at peak hours is 110. The total power requirement for moving all schedules is approximately 36,000 kw-hours per day. Until the arrangements for Niagara Falls power were carried through the property was operated from one somewhat antiquated direct-current generating station, whose total output capacity has for some time been seriously overtaxed by the increasing demands for power brought about by the increase in the company's traffic. It is the intention after Falls power is available to hold this station in reserve for emergencies,



PLAN OF SUB-STATION OF SYRACUSE RAPID TRANSIT COMPANY

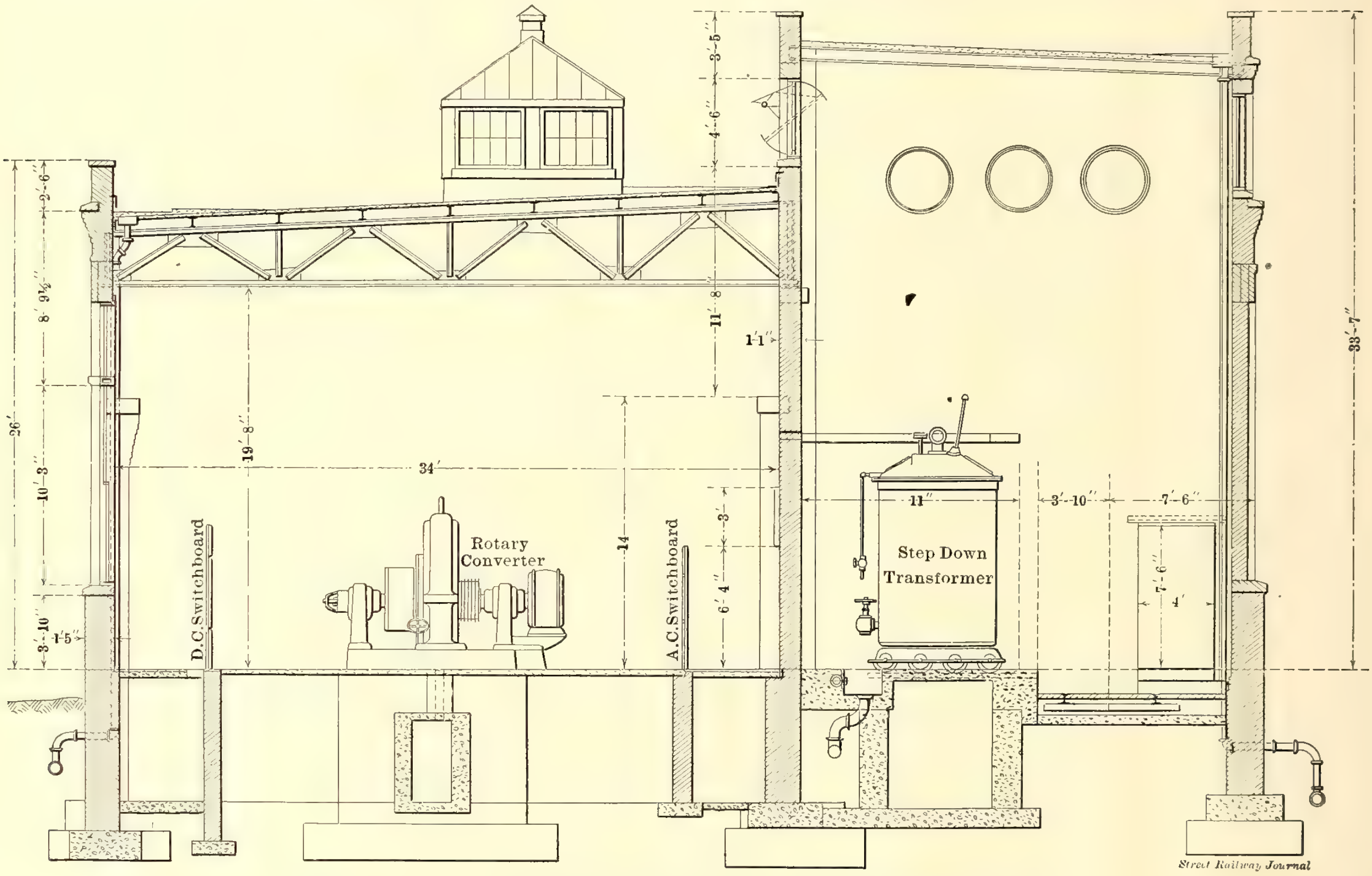
Briefly outlined, the new installation at Syracuse embodies the following features. Current is generated at the Niagara Falls (Canada) hydro-electric plant of the Ontario Power Company, and is delivered to the transmission lines of the Niagara Falls, Lockport & Ontario Power Company, which is the transmitting company, as 60,000-volt, three-phase, 25-cycle current. This current is delivered at the city line of the city of Syracuse to the transmission line of the Syracuse Rapid Transit Company at approximately 55,000 volts (based upon an estimated transmission loss of 8 per cent for the total distance of 160 miles). From the city limits the Syracuse Rapid Transit Company carries the current at this voltage over its own high-tension line, located along the Erie Canal, to its own sub-station, which has been built on the banks of the canal near the present power house of the company, about two miles from the receiving point at the city limits. In the sub-station the current is stepped down at one operation in lowering transformers from 55,000 volts to 430 volts a. c., thence passed through rotary converters and delivered to the railway feeders as 600 volts d. c.

The sub-station building is 74 ft. 6 ins. x 60 ft. outside measurement, and the interior is divided by brick partition walls into three divisions: The high-tension room, 22 ft. 1 in. x 33 ft. 11½ ins.; the transformer room, 22 ft. 1 in. x 36 ft. 7½ ins., and the rotary converter room, 71 ft. 8 ins. x 34 ft., inside measurements.

The building is built of pressed brick with steel roof framing. The sub-station roof consists of concrete slabs made as follows: The slabs were cast in a wooden form or mold the bottom of which was constructed of matched planks surfaced on inner side and spiked to cross-pieces so as to hold it in a true plane. A ½-in. layer of cement mortar, consisting of a 1-2 mixture, was spread on the bottom of the form, and the reinforcing, which is expanded metal (No. 10 gage and 3-in. mesh and 5-32-in. strands) was laid on this bed of mortar. The remaining 2½ ins. were filled with cinder concrete well tamped and troweled on the top surface. The cinder concrete was a 1-2½-5 mixture. As soon as the slab could be handled it was removed from the mold and the bottom surface was fixed up if it was found to be too rough. The slabs were laid with the long way of the mesh in the expanded metal, extending with the span. The slabs are 4 ft. 1 in. wide, 4 ft. 5⅞ ins. long, and 3 ins. thick.

The floor of the sub-station is concrete throughout, with concrete ducts and conduits in and beneath the floor for the cables and wiring.

The Westinghouse Electric & Manufacturing Company had the contract for delivering and installing all the sub-station apparatus, including the necessary bus-bars and wiring between transformers, switches and rotary converters.



CROSS SECTION OF SUB-STATION OF SYRACUSE RAPID TRANSIT COMPANY

The course of the cables through the sub-station may be traced from the drawings, and is substantially as follows:

The three high-tension cables drop from an anchor tower located 10 ft. from the west wall of the sub-station building to anchor insulators supported on angle-iron brackets projecting from this wall. From these insulators the cables pass through the wall of the building to a second set of insulators on the inside wall corresponding to those on the outside wall. Continuing on the same level in the upper part of the high-tension room, each cable passes to an inverted insulator suspended from the roof members (the taps to the high-tension lightning arresters being taken off just before the inverted insulator is reached). From the last mentioned insulator each cable makes a sweeping bend downward to the high-tension cut-out switches which are carried on an angle-iron girder supported from the side walls of the high-tension room. From the cut-out switches the course of the cables is down to the 60,000-volt oil circuit breakers, thence to the

series transformer, and thence to the static interrupter, all of which are located in the order named on the floor of the high-tension room. From the static interrupter the cables rise along the partition wall of the high-tension room, then turn and pass through the partition wall into the transformer room and thence to the three 60,000-volt lowering transformers. The high-tension cables within both the high-tension and transformer rooms are enclosed in ⅜-in. standard brass tubing. From the top of each transformer the low-voltage a. c. taps pass through the transformer-room partition wall into the rotary converter room and thence directly to the low-tension a. c. switchboard in the rotary room. Thence the cables drop below the floor, and by short runs through concrete ducts reach the a. c. sides of the respective rotaries. From the d. c. sides of the rotaries the cables again drop below the floor, pass by short runs through concrete ducts, and come up at the back of the d. c. switchboard. Thence

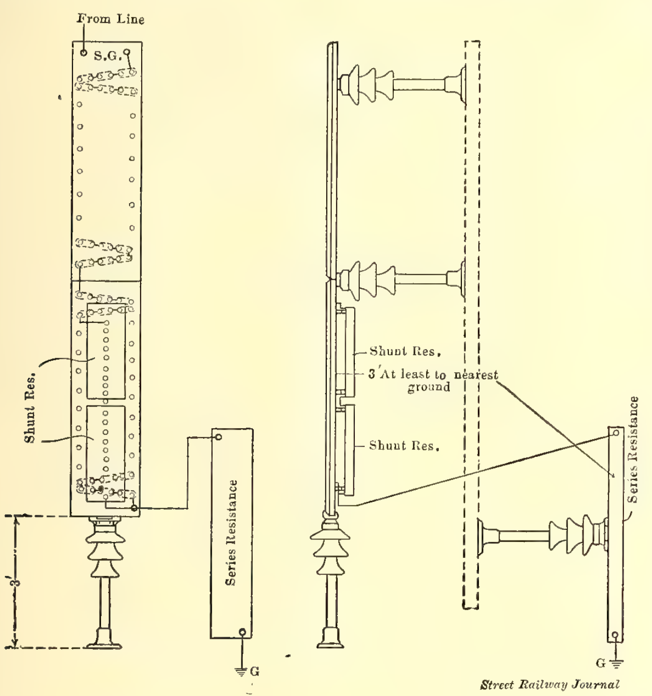


DIAGRAM OF CONNECTIONS FOR LOW EQUIVALENT A. C. LIGHTNING ARRESTER, 60,000 VOLTS—SYRACUSE SUB-STATION

the d. c. feeders fan, pass through wall insulators in the outside wall of the building and are distributed on feeder racks supported on poles located 12 ft. outside the south wall.

The method of bringing the high-tension cables into the sub-station building is somewhat unique. At the point of entry the building wall is pierced with three sections of 36-in. vitrified pipe, one for each leg of the three-phase circuit. Within each pipe is set a circular disc of ½-in. plate glass, each plate having a 3-in. hole through its center through which passes one cable of the circuit. The disc of plate glass takes the place of the more common method of filling the vitrified pipe with cement.

The high-tension room contains the protective and switching devices for handling the high-voltage current. The equipment in this room includes three 60,000-volt low equivalent lightning arresters; one 50-amp., 60,000-volt, three-pole electrically operated automatic oil switch with time-limit relay; three 1000-kw, 60,000-volt static interrupters, and the necessary cut-out switches, which are single-throw, hook type, 50-amp., 60,000-volt capacity.

A 50-cell, 40-amp. hour storage battery with necessary incandescent lamps, switches, etc., is provided for operating the various electrically controlled switches in the station.

TRANSFORMERS

The transformer room contains three single-phase, oil-insulated, water-cooled, high-duty 1000-kw lowering Westinghouse transformers. These transformers are designed for operation in oil, and the cooling is effected by means of water, circulated through cooling coils placed beneath the surface of the oil. The shell-form construction is employed, the iron laminations being placed in a horizontal plane. The transformers are designed to operate on a circuit having a frequency of 25 cycles per second. The high-tension winding is designed for a normal e. m. f of 55,000 volts, with provision for three additional voltages. The low-tension winding is designed for a normal e. m. f. of 430 volts, with provision for additional voltages.

Each transformer may be operated singly at any of the above voltages, or as one of a group of three transformers, connected in delta to change from the high-tension voltages, three-phase, to the low-tension voltages, six-phase. Each low-tension winding consists of three separate coils for supplying current to the three rotary converters, when the transformers are connected on three-phase circuits.

Each transformer is mounted in a cylindrical boiler-iron case, mounted upon a cast-iron base, and provided with a cast-iron cover, through which the terminals are brought out. The case measures 9 ft. 2 ins. from top of base to bottom of cap, and is 6 ft. 3½ ins. in diameter. A thermometer is provided near the top of the case for indicating the temperature of the surface oil. The thermometer is supplied with an electrical contact device for operating an alarm should the temperature of the oil become excessive. A valve is provided at the bottom of the case, by means of which, in case of fire or other emergency, the oil may be quickly withdrawn and run into a sewer. The cooling coils are of seamless brass tubing, spiral in form, and placed near the top of the oil. The coils were subjected to a factory test of 150 lbs. per sq. in., hydraulic pressure. The transformers have ventilating ducts of ample dimensions between coils, and at frequent intervals in the laminated cores, thus insuring a uniform temperature throughout the interior of the apparatus. The core consists of sheet steel of high magnetic quality, thoroughly annealed and specially treated to prevent aging.

The transformer efficiencies are guaranteed as follows:

One-quarter load............	94.2 per cent
One-half load	96.6 per cent
Three-quarter load...........	97.0 per cent
Full load	97.1 per cent
One-quarter overload.........	96.96 per cent

These efficiencies are based on single-phase operations at normal kilovolt-ampere rating, and at a ratio of transformation of 55,000 to 430 volts.

With constant voltage on the primary, and with the secondary delivering normal kilovolt-ampere output, the rise in secondary voltage, when the load is thrown off, is guaranteed not to exceed the following values, the percentages being based on the full load voltages: Regulation, 100 per cent power factor ⅛ per cent; 80 per cent power factor, 3.5 per cent.

The rise in temperature above the entering water is guaranteed not to exceed 40 degrees C. at normal full load on twenty-four hours' run with 5 gallons of water per minute; at one-quarter overload under same conditions the rise will not exceed 55 deg. C.

Before leaving the factory, the insulation from the high-tension windings to the low-tension windings and iron was subjected to a test of 120,000 volts alternating current for three seconds, and the insulation from the low-tension wind-

ing to iron was subjected to a test of 10,000 volts alternating current for the same period.

The weights of the different parts of the transformer are approximately as follows: Coils and iron, 9900 lbs.; case and fittings, 6600 lbs.; oil, 6800 lbs.; total, 23,000 lbs.

Each transformer is housed in a separate brick partition which is open at the front. For convenience in installing the transformer cases are mounted on wheels designed to run on rails laid on the floor of the transformer room.

ROTARY CONVERTERS

In the converter room are three 8-pole, 1000-kw, 600-volt (d. c.), six-phase, 3000 alternations (25 cycle) Westinghouse rotary converters. The collector rings are connected for six-phase current at approximately 430 volts. The normal full load rating of each machine is based on a direct-current load of 1667 amp. at 600 volts.

At the normal direct-current voltage, the power factor of the alternating current being 95 per cent or higher, the efficiencies of the converters are guaranteed as follows:

At one-quarter load..........	89.5 per cent
At one-half load.............	94.5 per cent
At three-quarter load.........	95.5 per cent
At full load.................	96.0 per cent
At 25 per cent overload.......	96.25 per cent
At 50 per cent overload.......	96.4 per cent

Each machine is guaranteed to operate for twenty-four hours at normal full-load rating with a rise in temperature in armature and field coils not to exceed 35 deg. C.; at 50 per cent overload for three hours, the rise in temperature will not exceed 60 deg. C.

The fields of the converters are compound wound, the shunt being arranged for self or separate excitation.

After completion, the insulation of the field coils from the frame was subjected to a puncture test of 5000 volts alternating current for a period of one minute.

The armature is of the slotted drum type. The core is built of laminated steel of high magnetic quality, and the sheets of steel are dovetailed accurately to the spider. The laminated core thus built up is held firmly between two end plates. The armature winding consists of strap-wound coils formed and insulated before being placed in the slots. The coils are held in the slots by retaining wedges of hard fibre. The insulation of the armature conductors consists of sheet material of high insulating quality applied in overlapping layers. This is held in place with tape, and the whole is treated with a moisture-proof and oil-proof compound. After completion, the insulation of the armature winding from the core was subjected to a puncture test of 3500 volts alternating current for a period of one minute.

The commutator bars, which are of the usual form, hard-drawn copper, with mica insulation, are held in position at one end by a cast-iron ring having a V section, and at the other end by a steel ring of a similar section firmly held in position by bolts. The brush-holders are of the sliding shunt type.

For securing thorough ventilation, large and open ventilating ducts are provided throughout the armature spider core and windings. The design of the rotating armature is such as to set up a forced circulation of air through these ventilating spaces. Space is left between the field coils so that a free circulation of air is maintained while the machine is in operation. The end windings of the armature are so arranged that the air will circulate freely among them, thus keeping their temperature low.

Each rotary is fitted with an oscillator to maintain a slight lateral motion of the armature and thereby prevent ridging of the commutator.

For starting, each rotary converter has an induction motor, known as type "C," with its revolving part mounted directly upon an extension of the converter armature shaft. This motor will be used for bringing the armature up to synchronous speed. The starting motor is so designed as to make the operation of starting, accelerating and synchronizing produce a minimum disturbance in the voltage of the supply circuit.

SWITCHBOARDS

The a. c. switchboard consists of one a. c. load panel, three a. c.-d. c. rotary panels, and one d. c. load panel.

The a. c. load panel consists of three blue Vermont polished marble slabs, 2 ins. thick, with ½-in. beveled edges. The top slab is 20 ins. long, 24 ins. wide; main slab 45 ins. long x 24 ins. wide, and lower slab 25 ins. long x 24 ins. wide. Upon this panel are mounted one lamp, brackets and shade; one long scale type F ammeter; three ammeter plug switches; one long scale type F voltmeter; one three-phase integrating totalizing wattmeter; one automatic synchronizer; one switch for controlling automatic, electrically operated main switch; one time-limit relay for the above switch, and one voltmeter shunt transformer.

The three rotary panels each consist of three marble slabs similar to the a. c. load panel. Upon each panel are mounted one lamp, bracket and shade; one 2000-amp., single-pole, type C circuit breaker; one 300-amp., type D, direct current ammeter; one three-phase power factor meter; two 2000-amp., single-pole, single-throw knife switches; one synchronizing switch to control electrically operated rotary switch; one three-pole knife battery switch; one voltmeter plug receptacle; one rotary converter rheostat and hand wheel for operating the same; and three 2000-amp, 600-volt d. c. recording wattmeters.

The direct current load panel consists of three marble slabs, the same as the rotary panel, excepting that they are 20 ins. wide instead of 24 ins. Upon this panel are mounted one 750-volt differential type E voltmeter, and one 12,000-amp., type E d. c. ammeter, complete with shunt.

In addition to the above there is a 2000-amp., single-pole, single-throw equalizing switch mounted upon one side of each rotary frame. A three-pole switch is also mounted upon the motor end of each rotary converter to control the starting motor.

The railway d. c. feeder switchboard consists of twelve blue Vermont marble panels, each panel being 2 ins. thick and comprising three slabs, the top slab measuring 20 ins. high, the lower slab 25 ins. high, and the middle slab 45 ins. high. Panel A, which controls a 2000-amp. railway feeder, is 20 ins. wide, and has the following apparatus. One lamp bracket and shade; one 2000-amp., 750-volt carbon break circuit breaker; one 2500-amp., type D ammeter; one 2000-amp., single-pole, double-throw, type D knife switch. Panels B, C and D are duplicates of panel A.

Panel E, which controls a 1500-amp. railway feeder, is 20 ins. wide, and has mounted upon it the following apparatus: One lamp bracket and shade; one 1500-amp., 750-volt., carbon break circuit breaker; one 2000-amp., type D ammeter; and one 1500-amp., single-pole, double-throw, type D knife switch. Panels F, G and H are duplicates of panel E.

Panel I, which controls two 1000-amp. railway feeders, is 24 ins. wide, and has mounted upon it the following apparatus: One lamp bracket and shade; two 1000-amp., 750-volt, carbon break circuit breaker; two 1500-amp., type D ammeters; two 1000-amp., single-pole, double-throw, type D knife switches. Panels J, K and L are duplicates of panel I.

Panel A is so connected that by closing the knife switch in the downward position it will supply current by means of the auxiliary bus-bar to each of the feeders, providing the switches to which these feeders are connected are also closed in the downward position. When so connected, this panel will be used only as an auxiliary panel to control feeders with a total capacity of 2000 amps.

With the d. c. switchboard are included main copper bus-bars of ample size to supply current to all of the feeders; an auxiliary bus-bar of 2000-amp. capacity, and all necessary detail wiring for instruments, etc. The complete switchboard is supported by a substantial iron framework.

The sub-station was designed by E. J. Cook, chief engineer of the Cleveland Electric Railway Company. The Syracuse Rapid Transit Company, of which Horace E. Andrews is president; J. J. Stanley, vice-president, and J. E. Duffy, general superintendent, let the contracts for the sub-station and transmission line, and the work has been carried out under its supervision. The construction of the sub-station was commenced Feb. 1, 1906, and it is anticipated current will be turned on about the 15th of the present month.

THE TRANSMISSION LINE

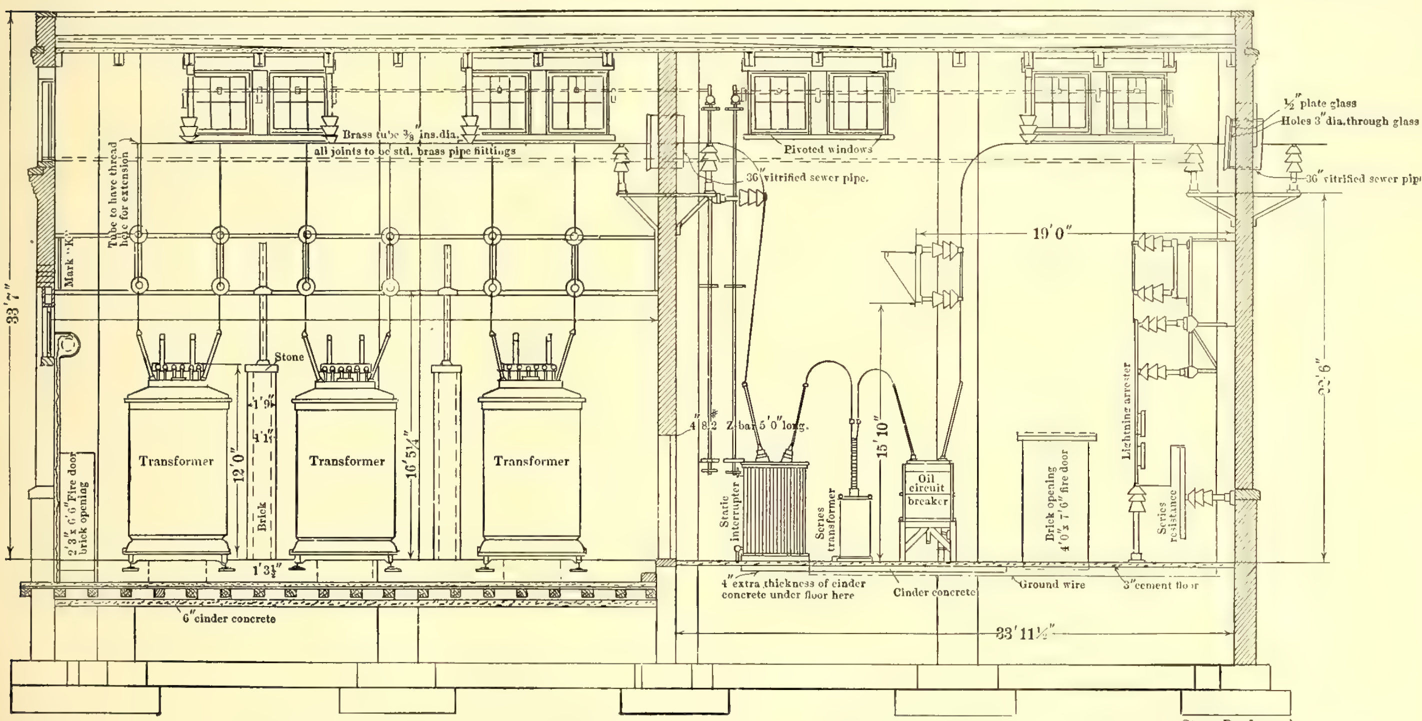
As stated, the Syracuse Rapid Transit Company receives the current at approximately 55,000 volts from the Niagara, Lockport & Ontario Power Company at the western city line of the city of Syracuse, and transmits it at this voltage through the city of Syracuse for a distance of two miles over its own high-tension line to its new sub-station on the bank of the Erie Canal at Tracy Street. The route of the transmission line within the city limits of Syracuse, as will be seen from the map on page 75, beginning at the sub-station, crosses the canal and follows the berm side of the canal for a distance of 1500 ft. The line then again crosses the canal and is located on the towpath side for a distance of 6000 ft., when it leaves the canal and runs across country to the city limits, where connection is made with the transmission line of the power company. The line crosses over three railroads and several factories and buildings. The Archbold-Brady Company, of Syracuse, acted as engineer and contractor for the work.

The line is carried entirely on steel towers especially designed by the contractor. There are forty of these towers on the route, the towers ranging from 45 ft. to 63 ft. in height, measured from the ground to top of bottom insulator. The total length of the towers in each case is from 10 ft. to 11 ft. longer than this when the sections entering the ground and extending above the bottom cross-arm are included.

An unusual feature of the work is the use of steel cable for the conductors. Each leg of the three-phase circuit consists of a seven-strand, 7-16-in., plow-steel cable. Each cable is strung in one length from the terminal at the sub-station to the terminal at the city line. Steel was used in these cables in place of copper or aluminum, primarily for greater strength. The average span is approximately 240 ft., the longest single span being 407 ft.

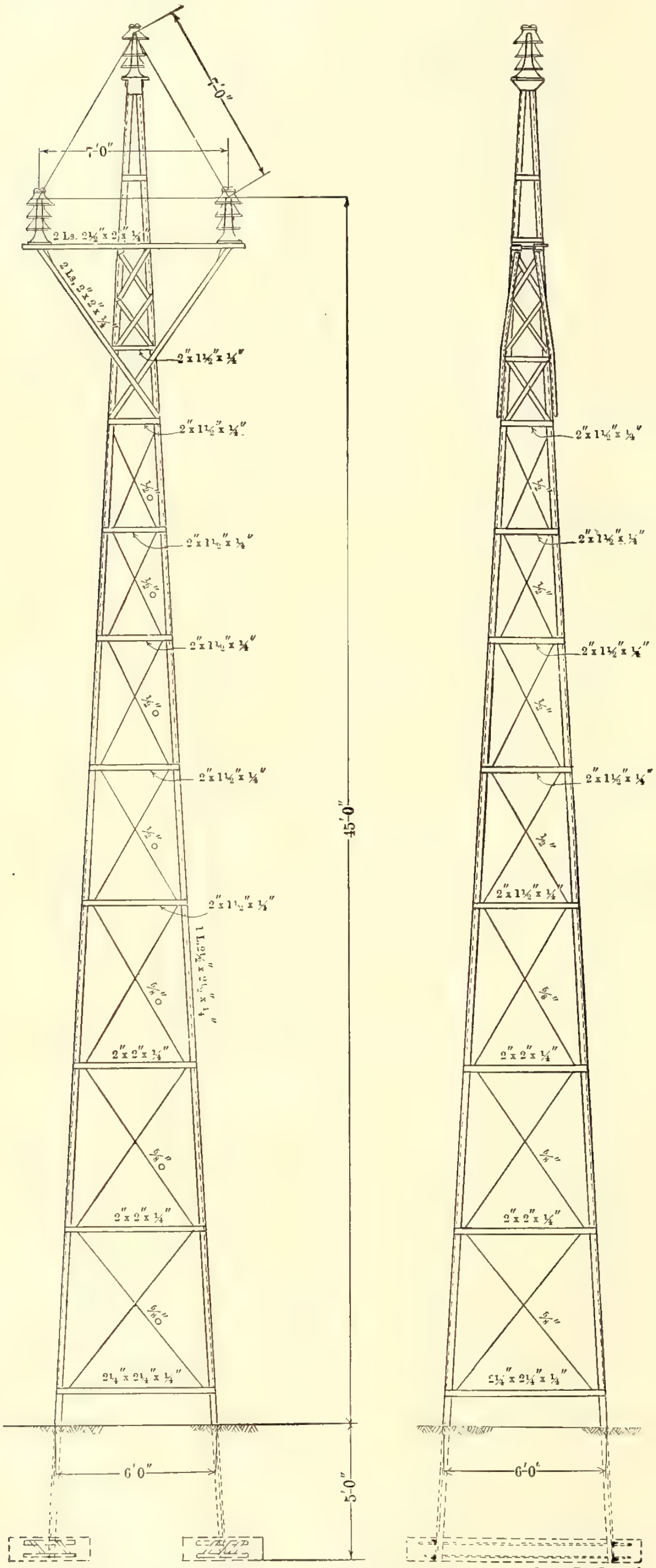
The insulators are 60,000-volt., triple-petticoat, porcelain type, supplied by R. Thomas & Sons Company, of East Liverpool, Ohio. The insulators are carried on the cross-arms by means of special malleable-iron pins designed by the contractor. The form of the pin is shown in the accompanying drawing. It will be noticed that the pin has a flat base designed to set squarely upon the cross-arm, to which it is bolted by means of four 5/8-in. bolts. This method of attaching the pins to the towers was adopted for greater convenience in installing. The parts of the insulators are cemented together and the insulators are connected by the pins. At the double cross-arm and dead-end towers the cables are clamped to equalizing saddles cemented to top of insulators. The saddles are arranged to facilitate removing a broken or defective insulator.

In designing the line the assumed wind load was taken as 1¼ lbs. per lineal foot of cable. This estimate was based on a wind pressure of 30 lbs. per ft. on a flat surface, or 15 lbs. on a round surface. The dead-end towers were designed also to provide for endwise strains under maximum wind and sleet loads, and calculating these strains, a sag not exceeding one-twentieth of the span was allowed. The minimum sag allowed was 1 ft. in 40 ft. The heights of towers was arranged to provide ample clearance over buildings and wires. The towers at the angles were designed to provide for side strains due to the tension in the cables based on the sags started, and



SECTION THROUGH HIGH-TENSION ROOM AND TRANSFORMER ROOM, SHOWING COURSE OF WIRING SYRACUSE SUB-STATION

also for the pressure of the wind on the cable and on the tower. Enough insulators were provided at the angle towers so that the cable does not make any angle of over 8½ degs. on any one insulator. Where possible, the cable was slacked off on spans adjacent to angles of over 3 degs. The towers



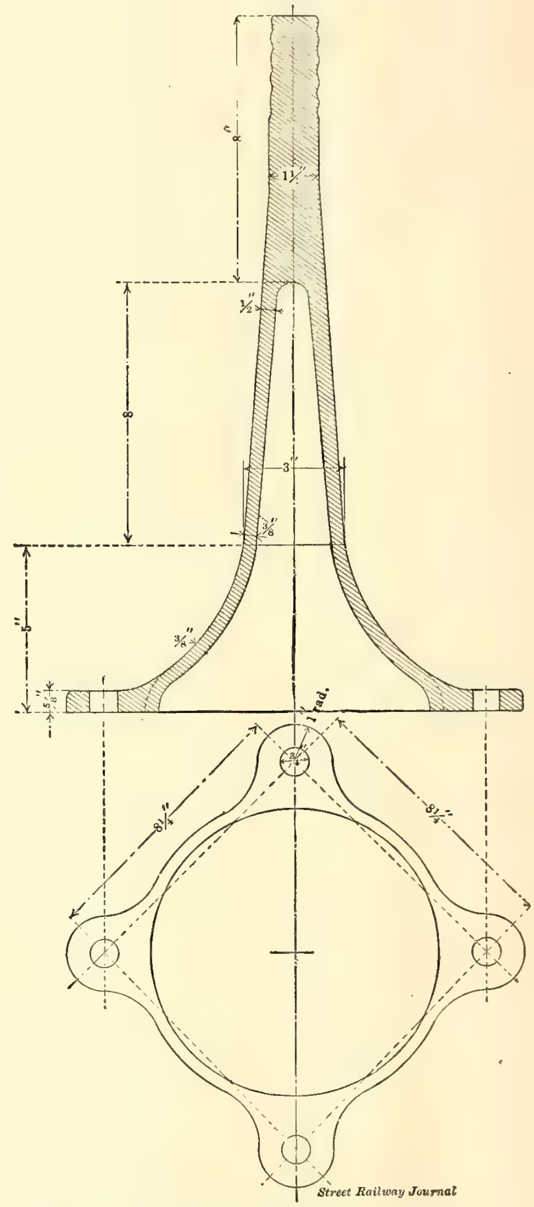
DETAILS OF 45-FT. ANGLE TOWER, USED IN CONSTRUCTION OF 60,000-VOLT TRANSMISSION LINE OF SYRACUSE RAPID TRANSIT COMPANY

at angles and dead-ends are stiff structures designed to provide for the greatest assumed strains.

The design of towers in general is shown in the drawing of 45-ft. tower herewith. In towers of greater height the section of upright members in lower panels was increased. The cross-arms of all towers were designed to resist torsional strains due to the pull of the cable on the tops of insulators. The maximum pull allowable with assumed unit strains on a single cross-arm tower was 1000 lbs. for each cable. The cross-arms of towers at dead-ends carry three insulators for each cable, and are designed to resist the maximum calculated pull due to the assumed conditions of load and sag. Bolted joints in the main members of towers were designed on the basis of 10,000 lbs. shearing per sq. in. and 20,000 lbs. bearing per sq. in.

The following are the chief features of the towers:

The towers are of the four-leg type and are built up of



DETAILS OF INSULATOR PIN FOR 60,000-VOLT TRANSMISSION LINE OF SYRACUSE RAPID TRANSIT COMPANY

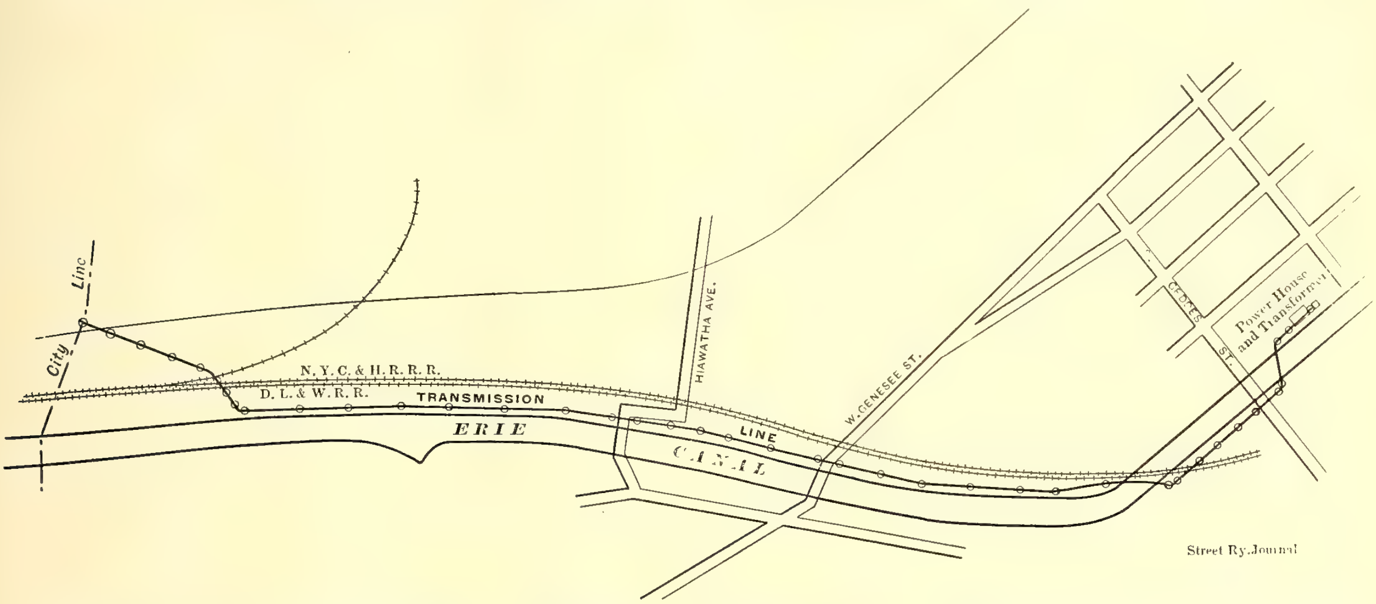
angles. The members of the upper section are laced and riveted together, and the horizontal members throughout are riveted to the upright members. The diagonal rod members are adjustable by right and left threads and clevices at the ends. The cross-arms are especially designed and braced to resist possible torsion should one or all of the cables break. All metal is ¼ in. thick or more.

Towers 57 ft. high and over are supported on concrete piers. Each leg of the tower is anchored by two 1-in. bolts running to the footings. The footing under each pier is 5 ft. x 3 ft. x 12 ins. thick, reinforced to resist uplift.

For the lighter towers under 57 ft. high, the concrete piers were omitted and the legs of the tower were spliced to angles which extend down into the footings. The footings are 8 ft. x 3 ft. x 12 ins., and are reinforced to resist uplift as well as down thrust. Each of these angles was enclosed below the ground line in a piece of stovepipe which was filled with cement grouting to prevent corrosion.

The towers were riveted in complete form so far as practicable at the shop, the actual field connections being bolted at the point of location before erection. The towers were raised and set, completely assembled, by the use of a tower wagon. The erecting wagon had a boom 40 ft. long, which was first raised by means of block and fall and a team of horses. The boom was then guyed three ways and used as a gin pole for erecting the tower. On similar work the contractor with this apparatus, one team, and a gang of eight men has raised as many as twenty towers in one day.

The towers were given one shop coat of red lead and oil and one coat in the field of graphite paint.



MAP SHOWING ROUTE OF HIGH-TENSION TRANSMISSION LINE IN THE CITY OF SYRACUSE OWNED BY SYRACUSE RAPID TRANSIT COMPANY

BIG DAY ON THE FOURTH FOR OHIO INTERURBANS

The action of the steam roads of Ohio in refusing to grant the usual cheap rates for July 4 turned a great mass of business to the interurban roads and furnished another example of how the two-cents-a-mile law is likely to prove a good thing for the electrics rather than a detriment. Reports from all parts of Ohio indicate that the traffic was the heaviest ever experienced, and in many cases it was simply a question of how many cars could be operated and how many the cars would accommodate. A large number of the lines annulled their freight and express runs and fitted up the express cars for passenger service by placing benches in them. The Columbus roads gave half-hourly service throughout the day and double-headed many of the runs. The Scioto Valley, Stark Electric and Lake Shore Electric made many of their runs in two and three-car trains. The lines in the Dayton-Toledo limited service double-headed their limiteds and ran half-hour local cars. The increased earnings over the same date last year experienced by two prominent Cleveland roads was probably equalled by a number of roads in various parts of the State. The Lake Shore Electric Company took in $7,600, as compared with $5,800 the previous biggest day, while the Cleveland & Southwestern Traction Company took in $4,800, as compared with $3,800 for the previous Fourth. In spite of record-breaking crowds, the cars were uniformly on time and no accidents were reported on any of the numerous lines in the State.

ANNUAL SESSION OF SOCIETY OF RAILWAY CLUB SECRETARIES

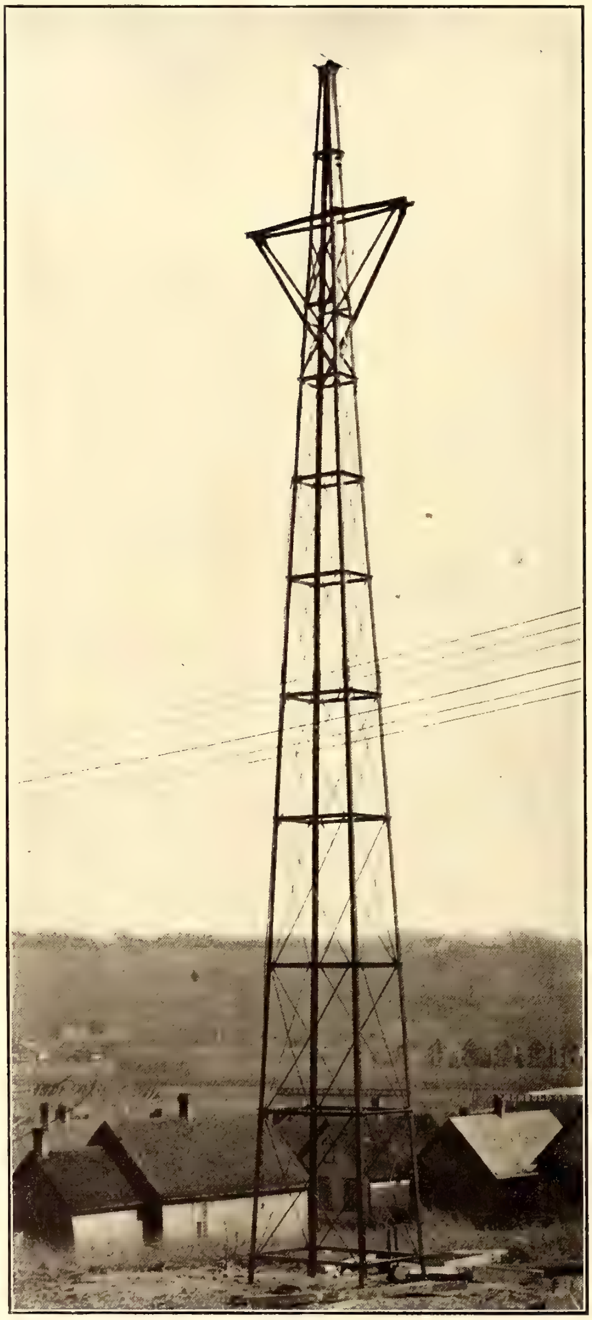
The Society of Railway Club Secretaries met in annual session at the Marlborough-Blenheim Hotel, Atlantic City, N. J., on June 15. After some discussion it was agreed that the society recommend to the various clubs that the proceedings of its annual meeting be published, with the official proceedings of the first fall meeting of each club, for the information of club members. It was also decided to send copies of the proceedings to the leading technical papers. A motion prevailed that the next meeting be held at New York on the second Saturday in December, this being done to avoid conflict with other conventions. An interesting paper was read by Mr. Powell on methods of securing advertising for society publications. The following officers were elected for the ensuing year: Chairman, J. D. Conway, Railway Club, of Pittsburg; vice-chairman, James Powell, Canadian Railway Club, of Montreal, and secretary, Harry D. Vought, New York Railroad and Central Railway Clubs, of New York.

An interesting relic of the San Francisco fire, and one that may represent a considerable loss to the United Railroads, consists of various masses of melted coin that the company recovered from its safes in the Rialto Building. At the time of the fire the United Railroads had many thousands of dollars in silver dollars, halves, quarters, dimes and nickels in the safes of Treasurer Starr, on the eighth floor of the Rialto Building. All the gold coin in the treasurer's office, contained in a separate safe, escaped unharmed, but the silver is unrecognizable. It consists of a small truckload of blackened masses of metal of irregular shape. Various metals are fused in the melted masses of coin, so that the company will probably be put to the expense of having them melted and refined. Treasurer Starr says that silver, nickel, copper and iron in unknown quantities are present in the big chunks of metal, the copper coming from melted one-cent pieces and the iron from the boxes in which the rolls of coin were packed.

TWO FORMS OF TRANSMISSION TOWERS IN NEW YORK STATE

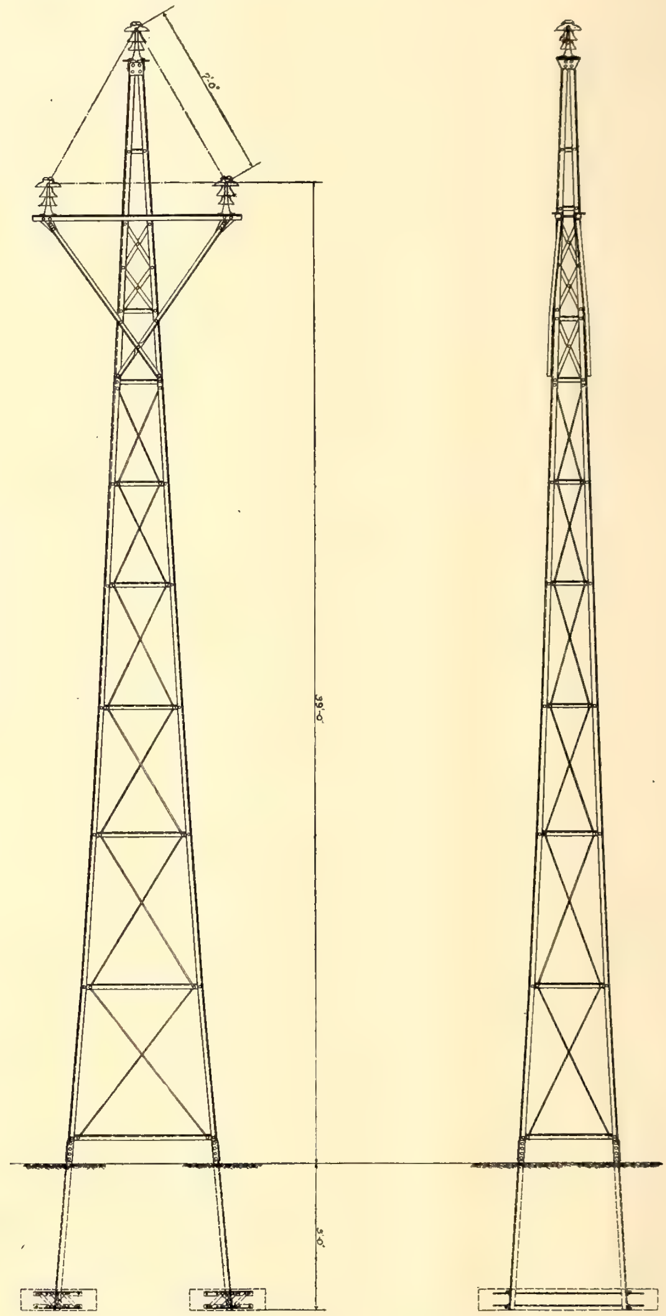
In the STREET RAILWAY JOURNAL for Nov. 18, 1895, an illustration was published of the steel tower adopted by the New York Central & Hudson River Railroad for carrying transmission wires, signal wires, telephone and telegraph lines, etc., within its electrical zone in and near New York City. Since this article was published, additional data as to dimensions and details have been received, which are given herewith. The illustration of the tower, published in the issue mentioned, is reproduced on the next page for convenience in reference.

The component parts of the tower consist of the following: Four L's 3 ins. x 3 ins. x 5-16 in.; lacing, one L 2¼ ins. x 1½ ins. x 3-16 ins. (single); connecting L's 2½ ins. x 2½ ins. x ¼ ins.; cap plate of malleable iron; rivets ¾ in. in diameter. The estimated quantities of material for one pole are: Steel, 1340 lbs.; concrete, 6.5 cu yds.; timber, 71 f.b.m.



TRANSMISSION TOWER OF ONEIDA RAILWAY ON WEST SHORE ELECTRIFICATION

The general conditions in installing the line are as follows: Distance from the center to center of poles on tangents is 150 ft., sag 30 ins.; distance on 1 deg. curve is 141 ft., sag 27 ins.; on 2 deg. curve 133 ft., sag 24 ins.; on 3 deg. curve 125 ft., sag 21 ins.; on 4 deg. curve, 118 ft., sag 18½ ins.; on 5 deg. curve 112 ft., sag 16½ ins.; on 6 deg. curve 107 ft., sag 15 ins. The sag of wires for all spans is computed at 70 degs. F. with no wind. Load on poles: Six-wire circuit No. 1, each 0.728 ins. diameter, area 400,000 cm., weight 1.22 lbs. per linear foot; four-wire circuit No. 2, 1-5 in. diameter, area 1,000,000 cm., weight 3.55 lbs. per linear foot; three wires, circuit No. 3, each 0.165 in. diameter, area 27,225 cm, weight .074 lb. per linear foot, together with ½ in. coating of ice on all wires. The wind pressure is 30 lbs. per square foot on the surface of the pole, and on all wires covered with ½-in. coating of ice. Unit stresses: Tension 30,000 lbs. per square inch net section; the compression is $\dfrac{30{,}000 \text{ lbs.}}{1 = \dfrac{L^2}{125r^2}}$ per square inch cross section; shear on rivets 22,500 per

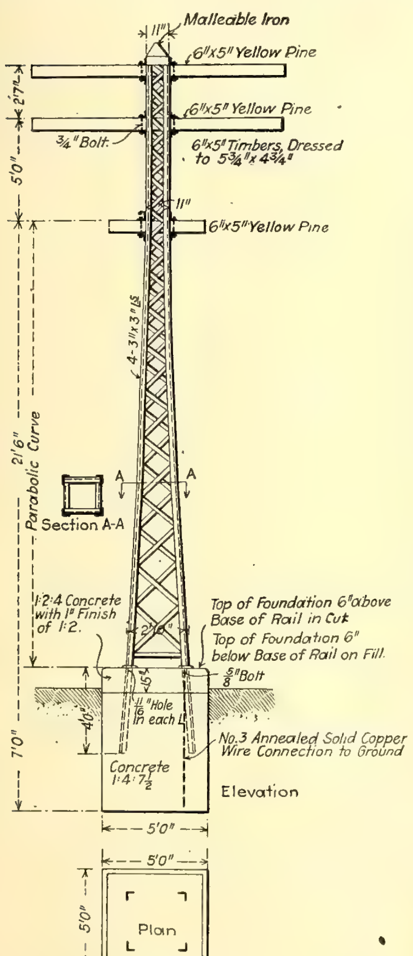


VIEWS SHOWING THE FRAMING OF THE ONEIDA RAILWAY TRANSMISSION TOWERS

square inch; bearing on rivets 45,000 lbs. per square inch; maximum bending moment on pole 2,910,000 inch-lbs.; maximum overturning moment of pole 3,340,000 inch-lbs. The painting is to be one coat of New York Central standard red-lead paint on each surface in contact before assembling, and one coat on the entire pole before leaving the shop. Before erection two heavy coats of New York Central asphaltum varnish are to be added.

In this connection are published a half-tone and line engraving showing the transmission tower adopted by the Oneida Railway for its West Shore electrification work, plans for which were published in the Street Railway Journal for May 19. These towers were designed by the Archbold-Brady Company, of Syracuse, N. Y.

The towers are to be, in general, as shown in the line drawing on page 76, and are rectangular in section. The horizontal members of the towers are riveted to the uprights and the diagonal members are adjustable rods with right and left-hand threads which screw into malleable-iron clevises at the ends. The standard tower on the West Shore line will be 39 ft. in height from the ground to the top of the bottom insulator, and these towers will be shipped out of the shop complete with the exception of the section which goes into the ground and the cross-arm. The drawing shows the general arrangement of the foundation, which is of reinforced concrete, especially designed to resist uplift, and for which the Archbold-Brady Company has patents pending. The cross-arm consists of two angles bent together and braced with angle braces on each side to resist torsion in case of broken wires.



STANDARD STEEL TOWER OF THE NEW YORK CENTRAL RAILROAD

Although the standard tower is 39 ft. in height, special towers will be required up to 69 ft. in height from the ground to the top of the bottom insulator, or approximately 75 ft. to the top. Where the legs of the tower extend below the surface they will be protected by a 6-in. concrete sleeve reaching 3 ins. above surface of ground. The towers, 57 ft. high or over, will have concrete pier foundations reinforced to resist uplift.

The pins will be of malleable iron and about 18 ins. high above the cross arm. They will be circular in cross section and attached to the cross arm with 4⅝-in. bolts. The surface of the pins will be smooth and so curved that there will be no sharp angle from which arcs might occur. The insulators will be furnished by R. Thomas' Sons Company, and will be that company's style No. 4002. The pins will be shipped to the Thomas factory and will be cemented into the insulators. The towers will be set in general about 480-ft. centers. On curves, towers will be closer together, compensating the strain due to the angle against the less wind pressure due to the shorter spans.

The cable will be of single No. 0 stranded copper and will be strung to a sag of 12 ft. at 32 deg. F. Where the spans are shorter, the sag will be decreased so as to have uniform strain in the cable. Where heavy strains occur, necessitating a double cross arm, the cable, instead of resting on the insulators, will be attached to an equalizing saddle to distribute the load equally on the two insulators. These saddles are so designed that in case one insulator should be defective it may be removed and another substituted without removing the cable from the saddle.

In preparing the designs and in making the calculations for this work, special attention was given to having a construction which would be of practically the same strength in all portions and in which there would be a minimum of field labor.

HANDSOME DRAWING ROOM CAR FOR AUGUSTA-AIKEN RAILWAY

In the Street Railway Journal of Nov. 19, 1904, was published an article describing the equipment of the Augusta-Aiken Railway & Electric Company, which consists of Brill semi-convertible cars mounted on high-speed trucks. These cars measured 33 ft. 4 ins. over the body and 42 ft. 9 ins. over the vestibules. The railway company has lately received two more cars of the same type, with the exception that the improved grooveless-post window system is included. One of these cars is slightly longer than the standard size of the rolling stock, and is furnished with easy chairs and draperies at the windows, and is intended for drawing-room service. The silk window draperies, plush chair cushions and handsome floor rugs are in harmonious shades of blue, and the ceilings are tinted in robin's-egg blue; mahogany, richly carved and inlaid, constitutes the interior finish, and altogether the appearance is most attractive. Transverse seats were also furnished for the car, so that when not required for drawing-room service it can be readily fitted for regular passenger service. The transverse seats were manufactured by the car builder, and are of the push-over-back type, upholstered in spring cane and furnished with nickel-plated grab handles. It is intended to run the car between Augusta and

DRAWING ROOM CAR ON THE AUGUSTA-AIKEN RAILWAY

Aiken without stops, on fast time, the distance being about 25 miles. The grades are easy and the curves of large radii, permitting a high speed to be maintained for all of the distance.

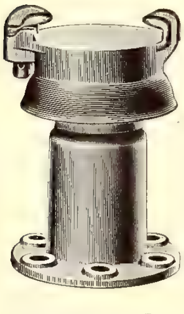
The length of this car over the end panels is 35 ft., and over the vestibules 44 ft. 5 ins.; width over the sills, including

THE HANDSOMELY FURNISHED INTERIOR OF THE AUGUSTA-AIKEN CAR

the side sheathing, 8 ft. 6 ins.; distance between the centers of the side posts, 2 ft. 9 ins.; from the track over the trolley boards, 12 ft. 6 ins.; size of the side sills, 4 ft. 7¾ ins.; and the end sills, 5¾ ins. x 6⅞ ins. The inside sill plates are 12 ins. x ⅜ in. Under trusses and double-trussed needle beams are used. The trucks are of the 27-E1 type, having a wheel base of 6 ins.; the wheel diameter is 33 ins. and diameter of axle 5 ins. The trucks are equipped with motors of 50-hp capacity each.

THIRD-RAIL SUPPORTS FOR THE METROPOLITAN ELEVATED, CHICAGO

The Albert & J. M. Anderson Manufacturing Company has recently booked a number of large orders for third-rail supports, the latest being for 2500 of a type similar to that shown in the accompanying cut, for the Metropolitan West Side Elevated Railway Company, of Chicago. Ever since the abandonment of the wooden blocks first used on the Chicago elevated lines, these third-rail insulators have been installed in very large quantities, and their continued use is suggestive of the satisfactory results obtained. These supports have also been used in Boston since the first installation of the third-rail system on the Boston elevated lines, and the company is now filling an order for a new type of the third-rail insulator to be used in Boston, and in which the insulation will be Ætna.

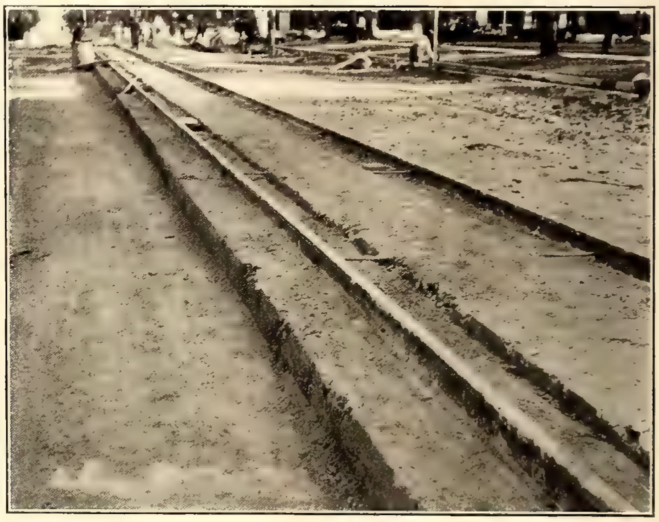


THIRD-RAIL SUPPORT

All passes have been abolished by the Metropolitan Street Railway Company, of Kansas City, Mo., and hereafter policemen, firemen, members of the Council, and motormen and conductors in uniform will be the only ones to ride free.

IMPROVEMENTS IN MADISON, WIS.

Since the Madison & Interurban Traction Company, of Madison, Wis., purchased all the property rights and franchises of the Madison Traction Company, recently, the road has developed remarkably. The accompanying views show the substantial manner in which the rebuilding of the tracks



CONCRETE ROADBED LAID BY THE MADISON AND INTERURBAN TRACTION COMPANY

has been carried out, one showing the method of laying the girders in concrete and the other the Belgian paving blocks being placed in position. The new rails are of 72-lb., 6-in. section in 60-ft. lengths, and the joints are cast welded. The company has completed plans for the erection of a new power house to serve urban and interurban traffic. A new car house has recently been erected, containing a machine shop, a blacksmith shop, and a paint shop, in addition to space for forty-two cars.

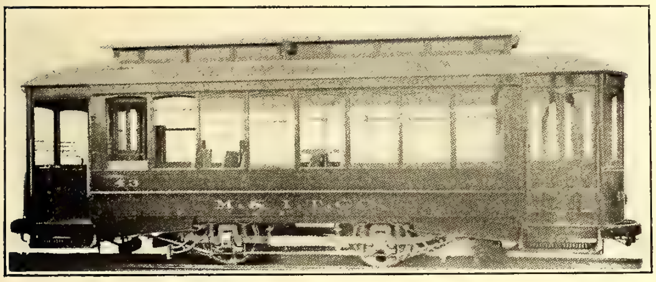
The city of Madison is situated between two lakes, and

TRACK CONSTRUCTION IN RESIDENTIAL STREET AND OPPOSITE THE STATE UNIVERSITY

several other lakes are in the immediate vicinity to the south. The street railway company proposes to extend its system so as to connect all of these lakes and to include also South Madison, at which time considerable excursion travel is expected. Other plans on foot are to connect Madison with Lake Michigan by trolley, touching Fond du Lac and Plymouth, thence to Sheboygan, an interurban line being already

in operation between the two last named cities. The company's regular schedule provides for the operation of about fifteen cars with extras during the hours of heavy travel and on special days. Seven thousand people, approximately, are carried each day, and from that number to 25,000 on special days. A ten-minute instead of a twelve-minute schedule is now being maintained, which the company is convinced will mean greater patronage and economy of operation.

The plan has been adopted of standardizing the equipment, and the Madison & Interurban Traction Company states that Brill cars and trucks have proved so acceptable and economical in operation that it has decided to make them its standard. The new addition to the company's equipment consists of ten cars of the grooveless post semi-convertible



SINGLE-TRUCK CAR FOR THE MADISON AND INTERURBAN TRACTION COMPANY

type, a car excellently suited to the local requirements. The American Car Company, of St. Louis, is the builder. The chief dimensions of the car are: Length over the end panels, 20 ft. 8 ins.; length over the crown pieces, 30 ft. 8 ins.; width over the sills, 7 ft. 9½ ins.; width over the posts at the belt, 8 ft. 2 ins.; sweep of the posts, 2¾ ins.; distance between the centers of the posts, 2 ft. 5 ins.; height from the floor to the ceiling, 8 ft. 4⅜ ins.; height from the track to the under side of the sills, 2 ft. 6⅜ ins.; width of the aisle, 24 ins. The cars are finished in cherry; ceilings of birch, painted and decorated. The 21-E single trucks have a wheel base of 8 ins., a wheel diameter of 33 ins., and carry 25-hp motors.

A NEW ELECTRIC MOTOR TRUCK

BY W. G. PRICE

The Standard Motor Truck Company, of Pittsburg, has been incorporated and has purchased a large plant at New Castle, Pa., which is being equipped with all new machinery especially for the manufacture of motor trucks. This plant will be ready for the manufacture of trucks about Aug. 1, 1906. The types of trucks to be manufactured are those which have been developed during the past three years at the works of the Standard Steel Car Company, at Butler, Pa., and include long and short wheel base double trucks and single trucks. The task undertaken by the company, and which has been successfully accomplished, has been the development of trucks which should possess the following features:

The frames to be of low carbon open-hearth steel, without welds.

All parts of frames to be secured by rivets instead of bolts, wherever possible.

All double trucks to have the journal boxes rigidly connected by equalizer bars.

No wear of the journal boxes and frames where these parts engage each other.

The brakes on double trucks to be carried on the equalizer bars.

All brake shoes and brake heads to be of the M. C. B. standard form.

The brake hangers to be kept tight automatically, so as not to require adjustment and not to wear out.

The brakes on long wheel base double trucks to have no brake beam, and the shoes to stay in line with the wheels and wear true.

All release springs to be carried so as to act at the top end of the live levers and not to be connected to brake beams.

The brakes to be adjusted automatically, so as to require no attention till the shoes are worn out.

The automatic brake adjuster to be simple in construction, enclosed so as to be protected from mud and water, and to be durable and easy to operate when worn shoes are replaced.

The journal box lid to be so designed that the forked check plate type of axle journal can be used, and the lid to be easily and quickly opened and closed, and when closed to be tight and secure from rattling.

The journal box of the large trucks to be designed to use the M. C. B. type of journal, journal bearing and wedge, but also to be prepared to receive the same journal bearing and wedge with the forked check plate to hold the axle against end movement.

The double trucks to be provided with swing bolsters, and the swing of the bolsters to be checked by means of friction, so as to prevent a cumulative side swing of the car.

The bolsters and transoms to be provided with removable wear plates, so that neither the bolsters nor the transoms can wear out.

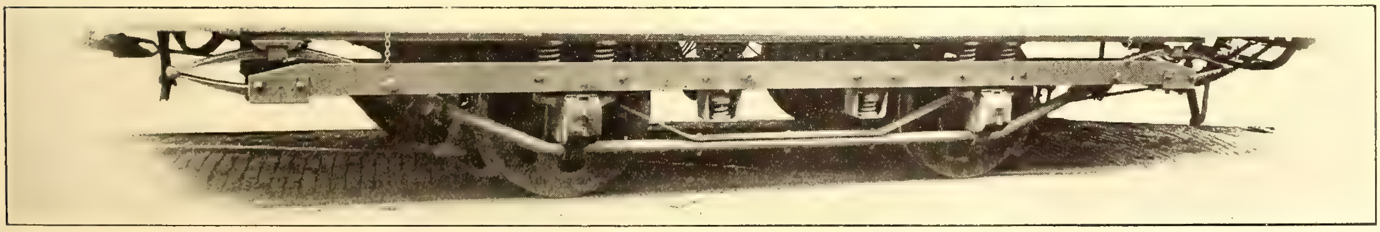
In the large double truck the motor to be suspended on the equalizer bars, or directly upon the transoms, as may be desired.

The single truck to have the journal boxes rigidly connected by a truss, which should support the top chord, so as to hold up the ends of long cars.

The single truck to run at all speeds over rough track, without galloping.

The value of the accomplishment of the above results must be obvious to all who are familiar with the equipment used in electric traction.

Rolled open hearth steel is undoubtedly the best material that can be used, but it cannot be safely used where it has to be welded; welds are always liable to be imperfect, and when rolled steel has been given a welding heat its condition



ELECTRIC RAILWAY TRUCK, TYPE C-35

changes to that of cast steel, and it does not receive sufficient working after welding to bring it back to the tough structure of rolled steel.

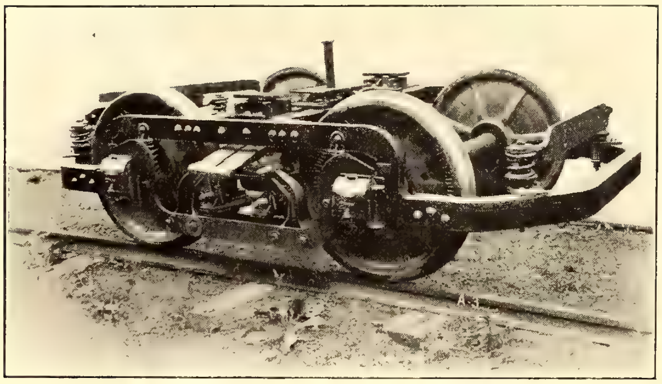
Rivets are used instead of bolts, because where rivets in sufficient numbers, driven with 45-ton pressure, are used, they do not come loose under the severest conditions of electric traction.

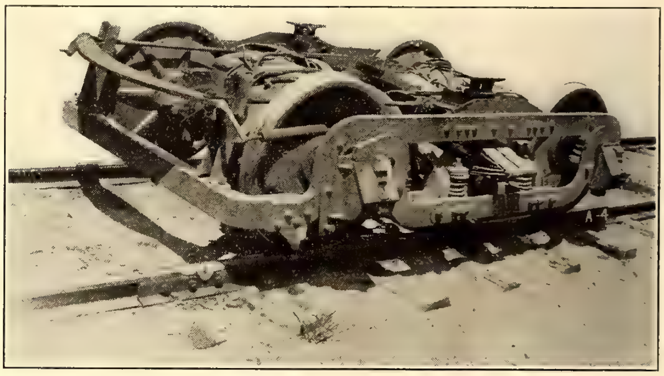
By rigidly connecting the journal boxes and making a close fit between the journal bearings and the insides of the boxes, there is no danger of the wheelings moving towards or away from each other, so as to cause the brake shoes to rub against the wheels—a condition which frequently exists with trucks not so connected, which have been in use long enough for the journal boxes and pedestals to become worn, and even in many new trucks in which the journal boxes are not a tight fit between the pedestals.

In this system of trucks the spring deflection necessary for easy riding takes place mostly in the elliptic bolster springs, which are long and never have more than four leaves in contact with each other, while the coil equalizer bar springs are made comparatively short, and are located between the equalizer bars and against the journal boxes. The equalizer bar springs are short and are so located that they are not deflected in a horizontal direction by the brake and motor head the shoes would stay in line with the wheels and wear true without the use of a brake beam.

Where release springs are attached to the brake beams they nearly always cause two of the shoes on each truck to press against the wheels, and so retard the movement of the car. This is caused by the variation in adjustment of the springs which pull against each other, and the use of shoes but little worn with others on the same truck more nearly worn out. To avoid this effect, all release springs are so attached as to act only at the tops of the live levers.

All of these trucks can be provided with automatic turnbuckles, which will hold the shoes about 3-32 in. from the wheels till the shoes are worn out. This turnbuckle is so constructed that when the brakes are applied, and also when they are released, it automatically lengthens itself, but it will not change its length when the shoes are nearer than 3-32 in. from the wheels. The distance at which the shoes are to be carried from the wheels can be made more than 3-32 in. if desired. The turnbuckle has a screw in a threaded pipe. The screw pushes out a piston which carries one jaw while the pipe carries the other jaw. The screw is turned by the longitudinal movement of the piston when the brake is applied and released. Ratchet teeth, which are cut on the ends of the screw and piston and which fit into each other, do the





ELECTRIC MOTOR TRUCKS, TYPES O-50 AND C-60

action sufficiently for the journal box jaws to come in contact with the pedestal part of the frame, so as to wear away those parts.

It was found that the damping effect of an elliptic spring having three or four leaves in contact gave the easiest riding effect, and when a larger number of leaves in contact with each other was used the riding was not as good. For this reason, when more than four leaves are required to carry the load the springs are made with sets of three or four leaves under the same bands, but independent of each other.

By carrying the brakes on the equalizer bars the vibration caused by the brake application was eliminated from the truck frame and the car body, and the shoes were always the same height on the wheels, so that the brakes were as efficient with a full load as with no load.

By locating the brake shoes at the M. C. B. standard height, and by placing stiff compression coil springs on the bolts which secured the hangers to the brackets and brake head, the rattle and chatter was greatly reduced. Moreover, wear on the brake hangers is practically eliminated, and that on the brake bracket and brake head and bolts brought to a minimum, while no adjustment or attention to these parts is required.

By avoiding the use of brake beams in the large trucks with inside hung motors, the number of parts is also much reduced, and there is more space in which to work at the motors. It was found that by a proper location of the brake work of adjustment. The screw cannot turn backward, as the teeth are always in engagement, so that the device is safer than the ordinary turnbuckle. When new shoes are to be put on, the screw is run back by revolving the piston. This device has been working under the severest conditions of mud, water and ice, without failure or indications of wearing out.

The journal box lid is held in place by a stiff spring which pulls it on from the point at the center of the lid where the spring is fastened. When the lid is open it hangs on the spring, which then acts as a hinge. When the lid is closed it can be quickly fastened by a thumb nut, so it cannot rattle or come loose.

The journal boxes for the large trucks are so constructed that either the standard M. C. B. form of journal or the forked check plate form can be used. Both forms use the M. C. B. journal bearing and wedge. The forked check plate form is preferred, as it prevents the longitudinal movement of the axle, which with the M. C. B. journal soon becomes as much as ½ in., causes the wheel flanges to wear out the groove in the brake shoes, and greatly adds to the side swaying of the car. The retarding of the side swing of the car on the bolster hangers by means of friction so as to absorb the energy of motion and prevent a cumulative swing of the car, makes the riding much easier and reduces trolley jumping.

The last previous improvement in the riding of cars was

made many years ago when the spring buffers were placed at the ends of cars so that by their friction against each other the swaying of cars in a train would be greatly reduced. The use of a similar friction device in the swing bolster constitutes another great improvement which will be greatly appreciated by the traveling public.

The suspension of the motors directly upon the equalizer bars prevents the vibration due to the operation of the motors from reaching the car bodies, and as the motor bars rest on top of the equalizer bars there is no chance for the motors to drop to the ground. In this truck the nose of the motor can be carried directly upon the transoms, if desired.

In the single truck the journal boxes form the vertical tension member of the truss, which supports the top chord. The journal boxes are thus rigidly connected as in the other trucks. The outside diagonal truss pipes carry stiff coil springs on their ends which support the extended ends of the top chord or frame, and enable the elliptic springs to carry the ends of the car so they will not bend down.

The single truck has been tested at all usual running speeds on very rough track, and does not gallop. It can be run at high speed on such track when other trucks which are carried on journal box springs alone can be run only at slow speeds. As there are no pedestal jaws, there is nothing on this truck to wear out.

ELECTRICAL ROLLING STOCK FOR THE ERIE

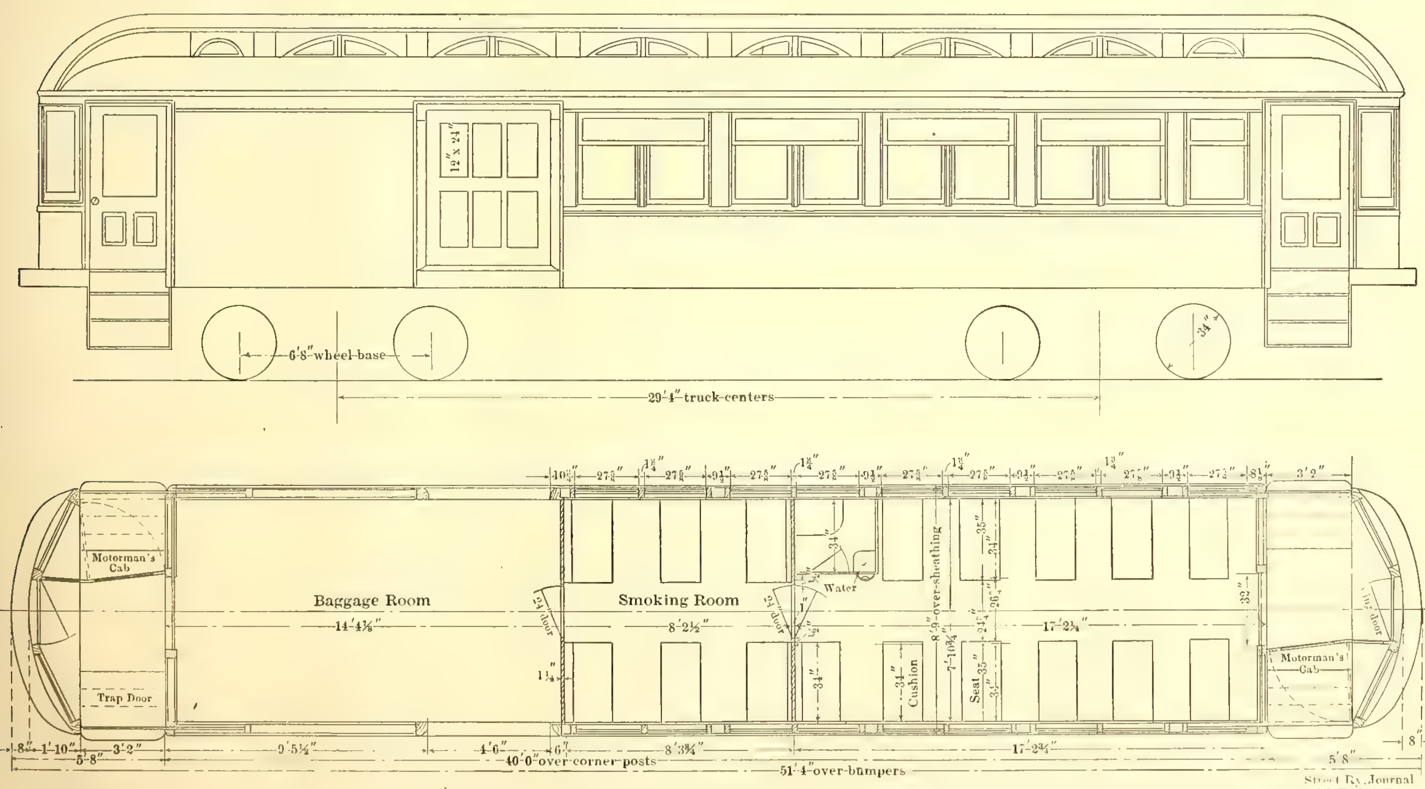
As announced in the Street Railway Journal of July 7, the Erie Railroad Company has ordered from the St. Louis Car Company one combination passenger and baggage car and four combination passenger and smoking cars, for the division between Rochester and Mt. Morris, which the railroad company is fitting up for electric operation. The smoking compartment will be furnished with rattan seats and the passenger compartment with plush. All of the cars will be mounted on the car builder's No. 61 trucks, with 34-in. diameter wheels, 6-ft. 8-in. wheel base; composite frame of steel and wrought iron, and 4¼-in. x 8-in. journals.

As noted in last week's issue, the regular passenger cars will have the following principal dimensions: Length of the car body, 40 ft.; length over the vestibules, 49 ft. 10 ins.; length over all, 51 ft. 4 ins.; and height of the car from the top of the rail to the top of the roof, 13 ft. 4 ins..

The bottom construction of these cars consists of side sills of 5-in. x 8-in. yellow pine with 6-in. channel and fillers. The intermediate sills are of 4½-in. x 6 in. yellow pine. The center sills are composed of 6-in. I-beams with fillers. The intermediate and center sills extend the full length from bumper to bumper. The platform is of the standard steel type. All the cars have upper and lower truss rods and needle beams of 5-in. I-beams. The bolsters consist of 10-in. plates. The end sills are 8-in. x 6-in. oak. The flooring is double.

There will be six double and one single window on each side of the car. All the lower side windows will be equipped with sash balancers. All sash are upper and lower and are of plate glass, the lower being arranged to raise, while the upper is stationary. The upper glass has a neat fine line of gold. The ventilators are of ornamental glass, half elliptic, and open on ratchets. The interior of the car will be finished in mahogany with marquetry inlay lines, of plain and neat design. The end doors are of the double sliding type. The ceiling is semi-empire. The seats are of the car company's reversible type, twelve on each side and four corner seats. There will also be continuous basket racks on each side.

The vestibules have a single sliding door on each side, with trap doors over the steps. The steps are of sheet-iron slides with wood treads. Each vestibule is provided with a double-acting swinging door so arranged as to form a motorman's cab which can be folded so as to enclose the controller, brakes, etc., and clear the vestibule for passengers and steps. A switch box is also placed on this side of the vestibule. The vestibule ends have single drop sash on each side and door with drop sash in center. The cars will be further equipped with St. Louis Car Company's arc headlight, sand boxes and vertical wheel brakes. There will also be a pilot on each end of the car, and Buhoup three-stem couplers.



SEATING PLAN AND ELEVATION OF PASSENGER AND BAGGAGE CAR FOR ELECTRIC OPERATION ON THE ERIE RAILROAD

FINANCIAL INTELLIGENCE

Wall Street, July 11, 1906.

The Money Market

Notwithstanding the unusually heavy decrease in cash reported by the clearing house banks on last Saturday, the money market displayed a decidedly easier tendency during the past week. The demand for money was more active, and bankers and individual lenders were disposed to offer with more freedom than has been the case heretofore. Money on call has been in plentiful supply at rates ranging from 4½ per cent to 2 per cent, and averaging about 3¼ per cent. In the time loan department rates have remained unchanged, at from 4½ to 5 per cent for two to four months, but for the over-the-year maturities the asking rate has declined ¼ to 5½ per cent. In some instances six months' money was obtainable at 5¼ per cent, the standing of the borrower and the character of the collateral offered being taken into consideration. At the present time there is nothing in the situation calculated to cause any disturbance in the money market in the near future. This week the depository banks will be called upon to repay into the Federal Treasury $10,000,000 special deposits, of which about one-fifth will come from the New York institutions. Later in the month provisions will have to be made for the taking up of the $30,000,000 2 per cent Panama Canal bonds. This transaction, however, will be of benefit to the banks, as it will not only enable them to take out new circulation for practically the full amount, but it is also possible that the Secretary of the Treasury will deposit in the banks the moneys derived from the sale of these bonds until wanted by the Government. New gold continues to arrive from the Klondike, and the additional arrivals of the yellow metal from that source are expected to considerably reinforce the reserves of the local institutions. During the week $1,500,000 gold was repaid to the Government on account of previous advances on gold imports from Europe, and a like amount of new gold was engaged in Australia for shipment to this center. The latter consignment, however, will not arrive until early next month. Rates for foreign exchange have ruled arouna the point at which gold may be brought from Europe, but up to this time local bankers have refrained from bidding for the gold arriving in the London open market from South Africa, so as not to disturb the money situation abroad. Foreign fire insurance companies have paid some of the losses incurred by the fire at San Francisco, but the amount of bills drawn against these payments has not been large enough to depress the sterling market to a level that would permit our bankers to draw gold direct from the Bank of England. The European money markets have been quiet but rather firm. The bank statement published last Saturday was decidedly unfavorable, inasmuch as it showed a loss in cash of $8,909,000. This heavy loss was due in part to the paying off of the $9,000,000 Baltimore & Ohio Railroad loan, and partly to the workings of the new law calling for an increase in the reserves of the trust companies. Loans decreased $6,366,800, as a result of the transfer of loans to foreign bankers. Deposits were $13,273,300 smaller than in the preceding week, and the reserve required was reduced on that account by $3,318,325. The surplus reserve decreased $5,590,675, bringing the total surplus down to $6,465,075. This compares with a surplus in the corresponding week last year of $7 957,825, $36,017,725 in 1904 $8,008,475 in 1903, $12,226,900 in 1902, $12,809,375 in 1901, and $15,589,200 in 1900.

The Stock Market

The stock market during the past week has been quiet, and to a certain extent an anonymous one. While at times there was selling pressure, there was a certain amount of buying power sufficient to absorb all offerings, but later the liquidation was on a large scale, and the buying power was correspondingly reduced. Apart from the heavy losses in cash sustained by the New York banks, as revealed by last Saturday's bank statement, and which resulted in a large reduction in the surplus reserve, the developments of the week were of a favorable character. Railroad earnings continued to show large increases over those for the corresponding periods of previous years, and according to all accounts the iron and steel industry was never in better condition than at present. Money continued to work easier; sterling exchange has declined, and there is reason to expect that local banks will be able to secure substantial amounts of gold in Europe for import to this side. The Government's monthly crop report was fully up to expectations, but it was received with indifference. The condition of winter wheat on July 1, 1906, was 85.6 per cent as against 83 per cent on June 1, 1906, 82.7 per cent on July 1, 1905, 78.7 per cent on July 1, 1904, and a ten years' average of 79.4 per cent. The condition of spring wheat on July 1 was 91.4 per cent, as against 93 per cent on June 1, 1906, 91 per cent on July 1, 1905, and a ten years' average of 88.2 per cent. The condition of corn was 87.5 per cent, as against 87.3 per cent on July 1, 1905, and a ten years' average of 86.4 per cent. The indicated yield of spring and winter wheat is 722,755,000 bushels, as against an indicated yield on June 1, 1906, of 713,-339,000 bushels, while the indicated yield of corn is 2,703,641,000 bushels, as against 2,651,000,000 bushels on July 1, 1905. Rumors that several of the larger railroad companies had been successful in placing loans abroad were emphatically denied. The Great Northern ore deal story was also revived, and this was responsible in a measure for the erratic movements in the Hill stocks. At the close the market had the appearance of being oversold, and in some quarters a recovery in prices is expected. The course of the market, however, depends upon the crops and the money market. Of the former pretty much is known; the latter is very uncertain, but at the present time there is nothing in the situation calculated to cause any disturbance in conditions in the near future. One of the principal features was the sharp break in the traction shares. The decline in Interborough-Metropolitan issue was attributed to selling by members of the pool, which is understood to have been dissolved. Brooklyn Rapid Transit was heavy, on the agitation in favor of the 5-cent fare within the limits of the borough of Brooklyn.

Philadelphia

The dullness prevailing in the general securities markets during the past week has been reflected to a considerable extent in the local traction shares. Trading in these issues included a very small number of stocks, but prices as a rule held fairly firm throughout the week. Philadelphia Rapid Transit was the active feature, upwards of 2400 shares changing hands at from 26 to 25. Philadelphia Traction displayed more activity than of late, about 800 shares selling at 98¾ and 99. Union Traction was decidedly firm, the price scoring a small net gain to 63½, on purchases aggregating about 1200 shares. Other transactions included American Railways at 52¼, Consolidated Traction of New Jersey at 79½, Philadelphia Company common at 49½ and 49⅜; the preferred at 50¼, Railway General at 6¾, and United Companies of New Jersey at 258.

Chicago

Trading in the local market for street railway issues was extremely dull during the week, and prices fluctuated rather sharply. North Chicago opened at 32 and dropped to 30, but subsequently recovered all of the loss, about 350 shares were dealt in. West Chicago, after advancing a point to 26, later lost all the improvement. Union Traction sold at 4⅝, and South Side Elevated brought 95 for a small lot.

Other Traction Securities

The feature of the Baltimore market was the strength in United Railway incomes, which advanced a point on the announcement that the management of the company would soon make known its plan for refinancing the property. While nothing officially has been given out regarding the plan, it is said that the plan provides for the funding of the overdue coupons on the income bonds, which amounts to about $1,400,000, by an issue of certificates of indebtedness which will bear interest at 5 per cent. About $50,000 of the income bonds changed hands at from 72½ to 73½. The 4 per cent bonds were very quiet, about $20,000 selling at 92⅛ and 92¼. The free stock sold at 15, while 300 shares of the pooled stock brought 15⅞. Other transactions included Norfolk Railway & Light stock at 19, and $31,000 of the 5 per cent bonds

at 99¼. In the Boston market interest centered largely in Massachusetts Electric issues, both of which displayed decided strength. The common, after selling at 18½ rose to 19, while the preferred advanced from 68½ to 69¾, on purchases of less than 500 shares. Boston Elevated opened firm at 153, but subsequently dropped a point and closed at the lowest. Boston & Worcester common was steady at 27 and 27½, and sales of small lots of the preferred were made at 77 and 80. West End common sold at 96½ and 96¼, and of the preferred at 110.

At Cincinnati last week, Cincinnati, Newport & Covington had another upward movement, advancing from 72¾ to 73¼, a high mark for this stock, which has been arrived at by speculative trading, as the stock is not on a dividend paying basis. The preferred declined from 96½ to 96 on small sales. Cincinnati Street Railway sold at 142½, a fractional decline. Toledo Railways & Light sold at 33, and Cincinnati, Dayton & Toledo at 26½, both slight declines.

At Cleveland, after making a low figure of 74¾, Cleveland Electric showed signs of increasing strength, on indication that the company is about to put up a fight to regain the ground lost to the new low-fare company. Early this week the stock sold at 75½. Northern Ohio Traction & Light advanced to 30⅛, and Lake Shore Electric moved up fractionally to 16¾. On the curb there has been considerable trading in Toledo & Western at 6½, even with the price offered by the Nutt syndicate, which is trying to buy the property now in receiver's hands.

At Columbus, Columbus Railway advanced slightly from 84 to 86, on the announcement that the company had taken over the Central Market lines, the rival local system. It is figured that in the long run these lines will prove a valuable acquisition to the system, although at present their earning power is small. Scioto Valley preferred was in good demand at 93¼ to 94½.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks and the active bonds as compared with last week:

	July 5	July 11
American Railways	52¼	52⅛
Boston Elevated	153	152
Brooklyn Rapid Transit	72½	73⅜
Chicago City	—	—
Chicago Union Traction (common)	4	4⅛
Chicago Union Traction (preferred)	12¾	12¼
Cleveland Electric	81	81
Consolidated Traction of New Jersey	—	77
Detroit United	92	92
Interborough-Metropolitan, W. I	36½	35
Interborough-Metropolitan (preferred), W. I	72¼	73¾
International Traction (common)	58½	a55
International Traction (preferred), 4s	82	79
Manhattan Railway	147⅞	148
Massachusetts Electric Cos. (common)	18	18
Massachusetts Elec. Cos. (preferred)	a69	a69½
Metropolitan Elevated, Chicago (common)	26	26
Metropolitan Elevated, Chicago (preferred)	67	67
Metropolitan Street	—	—
North American	92¼	92¾
North Jersey Street Railway	27	27
Philadelphia Company (common)	49¼	48⅝
Philadelphia Rapid Transit	24¼	30
Philadelphia Traction	99	99
Public Service Corporation certificates	68	67
Public Service Corporation 5 per cent notes	95½	95¼
South Side Elevated (Chicago)	95	96
Third Avenue	125	124
Twin City, Minneapolis (common)	111	113
Union Traction (Philadelphia)	63	63
West End (common)	—	—
West End (preferred)	—	—

a Asked.

Metals

According to the "Iron Age," steel-making iron continues scarce, the scarcity being more prominent in Bessemer pig in the Central West. The market for foundry iron is more encouraging and shows a firmer feeling. While some large steel rail business for next year is pending, actual sales during the past week have not been large. The structural shops are getting in a good deal of work. The Western agricultural implement manufacturers have resumed work at their plants for the 1907 season. So early a start is unprecedented. The situation in steel bars is thoroughly sound.

Copper metal holds firm. Quotations are 18½c. to 18⅝c. for lake, 18⅛c. to 18⅜c. for electrolytic, and 18c. to 18⅛c. for castings.

SCHOEPF HOLDING CORPORATION TAKES OVER PROPERTIES

The Indiana, Columbus & Eastern Traction Company, the recently incorporated holding and operating corporation formed to take over the Schoepf interurban properties, assumed actual charge of the various properties on July 1. This system now embraces the largest interurban system in the country operated under one management. The roads acquired include 446 miles of operating traction lines, in addition to a large mileage under construction. These roads extend in an unbroken line from Zanesville, Ohio, to Richmond, at the Indiana State line, and from Cincinnati north to Toledo with numerous branch lines covering the greater part of Central Ohio. The properties absorbed and their mileage is as follows: Zanesville Railway, Light & Power Company, 15; Columbus, Newark & Zanesville, 41; Columbus, Buckeye Lake & Newark, 39; Central Market Street Railway, 20; Columbus, Grove City & Southwestern, 12; Columbus, London & Springfield, 52; Dayton, Springfield & Urbana, 45; Urbana, Bellefontaine & Northern, 40; Springfield & Western, 12; Dayton & Western, 40; Dayton & Northern, 41; Dayton & Muncie (Ohio part), 12; Lima Railways & Light, 12; Ft. Wayne, Van Wert & Lima (Ohio part), 40; Columbus & Lake Michigan (steam), 35; total operating mileage, 446. Under construction, Lima-Toledo, 75; Lima-Bellefontaine, 45; total under construction, 120.

The Schoepf syndicate also owns in Ohio the Cincinnati Northern Traction Company, the Cincinnati Interurban and the Cincinnati Traction Company, but these are not included under the new operating arrangements. The Indiana, Columbus & Eastern Railway Company has been mortgaged for $18,250,000 in two mortgages of $12,000,000 and $6,250,000 each to take over the underlying issues of the companies acquired.

J. B. Foraker, Jr., has been elected president of the new company; H. W. McAllister, vice-president; Thomas Fitzgerald, Jr., secretary-treasurer; W. Kesley Schoepf and John C. Gallagher. Mr. Schoepf is chairman of the board.

ELY SYNDICATE TAKES OVER STEUBENVILLE PROPERTY

The property of the Steubenville Traction & Light Company was transferred on July 1 to the Ohio Valley Finance Company, better known as the Ely syndicate. The transaction involved about $2,000,000. J. Charles Ross, heretofore general manager of the property, will continue with the American Gas Company, former owners of the property. The new owners have announced that they will spend about $150,000 in immediate improvements. The greater portion of the system will be double tracked, it being the intention of the syndicate to have a double-track line between Wheeling and East Liverpool. Twenty-five new cars for city and interurban service will be purchased, and extensive improvements will be made at Stanton Park, the amusement resort operated by the company.

The company has been reorganized with the following officers: Van Horn Ely, president; Edward McDonald, secretary-treasurer; J. C. Rothary, general manager. The new directors are: Van Horn Ely, Edward McDonald, William McD. Miller, J. H. Kinney and Nelson D. Miller. The deal includes the Steubenville & Pleasant Heights Railway, the new line to LeBelle, the electric illuminating and gas properties, Stanton Park, and the line to Toronto with the Toronto lighting plant. The Toronto line will be extended north from Toronto to Wellsville. The Ely syndicate owns the lines at East Liverpool, Wellsville, Chester and Rock Springs, and has a special charter for the Ohio River & Passenger Railway to construct and operate a street railway line to Beaver, where connection will be made with the Beaver Valley Traction Company reaching Rochester, Beaver Falls, Monaca, Freedom and Conway. This line is being extended through Baden and Ambridge to Leipsdale.

THE ARNOLD REPORT ON UNDERGROUND CONDUIT CONSTRUCTION AND SUBWAYS IN CHICAGO

The report of B. J. Arnold to the committee on local transportation, of the Chicago City Council, known as "Arnold Report No. 9," and referred to briefly in the issue of the Street Railway Journal for July 7, was presented to the Council last week. It is devoted to a consideration of three questions, viz.: (1) Whether the trolley or the underground conduit system should be adopted in the downtown streets in Chicago. (2) The disposition of the river tunnels, that is, whether they shall be abandoned or reconstructed at a lower depth to facilitate navigation, and utilized in the future as parts of a surface transportation system, or be so reconstructed that they will at once, or ultimately, become parts of a permanent subway system; and, (3) whether any subway shall now be built, and, if any, how much.

In regard to the underground conduit vs. overhead construction, Mr. Arnold points out that, as stated in his report of 1902, it is possible to construct and operate the underground conduit in the City of Chicago. As the cars will have to use the trolley in the suburbs, it is necessary to settle upon certain places where they will change from trolley to conduit. If these places are far removed from the center of the city it will mean a very largely increased cost for the conduit construction as compared with the overhead. If near the center of the city, it will mean delays caused by changing in the zone of congested traffic. Moreover, if the latter plan is followed and only a limited amount of underground conduit construction is decided upon, and that in the strictly central districts, the benefits will not be sufficient to justify the additional cost. That is to say, the change from underground to overhead will be attended with annoyance which will substantially equal that which will arise from the use of the overhead trolley in the business district. There are other objections to the immediate construction of the underground conduit in the business district, arising from the necessity of a certain amount of sewer reconstruction in that district, and the possible installation of a high-pressure water system. The subway question is also involved and is of great importance. To construct underground conduit on streets which are likely to be used for subways within any reasonable time would be obviously uneconomic, as these conduits would have to be taken out in the event of a high-level subway being constructed in any street where conduit construction had previously been built. For instance, State Street is now one of the streets, if not the principal street, upon which underground conduit is desired from the public point of view. In the plans which Mr. Arnold has heretofore recommended for subway construction he has advised a high-level subway on State Street. If there is any probability of the construction of such a subway in the early future he thinks that it would be unwise to install an underground conduit on this street at the present time.

As it is now proposed to reserve to the city, or its licensee, the right to purchase the entire railway system for the value of the present property and additional investment for improvements, it would appear to him wise to omit the construction of any underground conduit at the present time, but to specifically reserve, in any ordinances or permits that may be granted, the right that the city may require the construction of underground conduit as soon as the subway and sewer questions have been disposed of, and the city has then determined upon a sufficient amount of conduit construction to carry the transfer points well out of the business center. Mr. Arnold recommends, however, that all feeder and transmission wires should be placed underground within a district at least as large as that prescribed by the ordinances recommended by the committee on Dec. 4, 1905.

In regard to subway construction and the river tunnels, Mr. Arnold recommends subway plan No. 2, described in his report of 1902 (published on page 145 of the Street Railway Journal for Jan. 24, 1903). He states that such a system could be constructed more easily than was thought at that time, because then the Illinois Telephone & Telegraph Company contemplated the construction of some large bore subways which it has now abandoned. He suggests the advisability of confining any subway construction in the immediate future to the smallest possible amount that will take care of the traffic which is intended to pass through the river tunnels when lowered and reconstructed. He then recommends for immediate construction a low-level, single-track subway loop passing through the Van Buren Street tunnel, south on Market Street to Van Buren Street, thence proceeding eastward in Van Buren Street to Michigan Avenue, thence north in Michigan Avenue to Washington Street, thence west in Washington Street through the Washington Street tunnel. This single-loop tunnel to be connected on Market Street by a single-track, low-level tunnel between Washington and Van Buren Streets. The complete loop thus constructed would take care of the west-side traffic passing through the river tunnels until such time as it became necessary to construct a third river tunnel in Adams Street, and additional loops as shown in the completed subway plan No. 2. By retaining the present eastern outlet to the Van Buren Street tunnel, which could easily be done, since it is on private property, and does not interefer with the surface of any street, the subway loop could be brought to the surface and distributed over surface loops at any time when, through accident or otherwise, congestion occurred on the west side subway loop.

To take care of the north side traffic, which would pass through the reconstructed La Salle Street tunnel, there should be a low-level, double-track subway, extending from the La Salle Street tunnel south on La Salle Street, gradually rising to Randolph Street, where it becomes a high-level subway; thence east on Randolph Street to Clark Street where the tracks would divide, one extending eastward on Randolph Street through a single-track, high-level subway to Dearborn Street. The other track would swing south on Clark Street through a single high-level subway, and extend south on Clark Street to Monroe Street. A double-track, high-level subway should extend on Dearborn Street from Randolph Street to Monroe Street, and on Monroe Street from Clark Street to State Street, thence southward to State Street to Fourteenth Street, or whatever point the committee may determine upon as the present temporary southern entrance to this subway. A single track only would be laid at present in Monroe Street from Clark Street to Dearborn Street, and in Dearborn Street from Monroe Street to Randolph Street, and a double track in Monroe Street from Dearborn Street to State Street. This arrangement would permit a double-track subway route between the north and south sides of the city, as well as provide for subway loops for all traffic coming through the river tunnels from the north and west sides. All of these subways when constructed would be susceptible of future development in connection with the complete subway system such as was shown in the report of 1902.

If it is desired to provide for through routeing of cars, through subways from the west side to the north side, and from the west side to the south side, this can be taken care of, in Mr. Arnold's opinion, by the construction of a double-track, low-level subway on Randolph Street, beginning at La Salle Street where it would connect with the La Salle Street tunnel subway, thence west to Market Street, thence south on Market Street to Washington Street, but he does not consider the construction of this piece of subway necessary at the present time, as it would be built solely for the purpose of through routeing from the west division to the north and south divisions, which routeing can be effectually accomplished with the surface systems.

The costs of the proposed improvements will be as follows:

To construct the low-level subway loop and north and south subways, as above described and recommended, will cost approximately $4,800,000.

If the double-track connection on Randolph and Market Streets, for the purpose of through routeing, is desired it will cost an additional $40,000.

If no subways are built on Clark, Monroe and Dearborn Streets, and the double-track subway is extended on State, Randolph and Market Streets, the cost would be approximately $4,500,000.

The above figures do not include the cost of changing the river tunnels, or damages to property.

CHANGES IN PLAN OF ISSUING BROOKLYN TRANSFERS

A radical change was made by the Brooklyn Rapid Transit Company on Saturday, July 7, in the method of issuing transfers. Heretofore all transfers have been handled by the conductors, except where the interchange of traffic is large. Here transfer agents were stationed. The reasons given by the company for the change are three in number: (1) To eliminate any possibility of collusion in exchanging transfers. (2) To facilitate the work of the conductor by giving him more time for collecting fares and attending to the various other duties of his position. (3) To dissolve once for all the necessity of asking the conductor for a transfer, thus doing away with any chance for a misunderstanding between conductor and passenger. The change, while it involves untold trouble to the company and no small expense, is in line with the announced policy of the company constantly to better and extend its service.

COLUMBUS RAILWAY TAKES OPPOSITION LINES

The Schoepf syndicate, which acquired the Central Market Street Railway of Columbus, and the Appleyard interurban properties, has turned the operation of the small city line over to the Columbus Railway & Light Company. The Central Market Street Railway was built to afford an entrance for the interurban lines, the city lines in Columbus being broad gage. It owns 16 miles of track and operates under lease 15 miles belonging to two of the interurban roads. It also controls the interurban loop under lease, so that it was necessary for the Schoepf interests to buy it when they did the interurbans. The road has never been a paying investment, due to the fact that it was obliged by franchise to sell eight tickets for 25 cents, and as an independent property it was doubtful if it would even earn the interest on its bonds. It is stated that the arrangement with the Columbus Railway & Light Company is not a sale nor even a lease. The city company simply takes over the operation and agrees to operate the lines and maintain them in good physical condition and pay the bond interest if the property earns it. The routes will remain as heretofore, and it is probable that the power station will be kept in operation as at present. The change is an advantage to the patrons of the road, in that the seven for a quarter tickets of the Columbus Railway & Light Company will be accepted on the Central Market cars and transfers will be given to these lines on these tickets, and while the cheaper tickets of the Central Market Street Company will still be sold, they will not be accepted on the cars of the old company, nor will transfers be granted on them except to other Central Market Street lines.

TOLEDO & WESTERN IN RECEIVER'S HANDS

The Toledo & Western Railway Company has been placed in the hands of C. F. Franklin, general manager of the company, as receiver on complaint of A. E. Bingham, of Swampscott, Mass. The plaintiff made statement that the company owes more than $300,000, and that he cannot make levies to pay the debt because all the property is under mortgage. It appears that the financial difficulties date back a year, when the floating debt was made to take care of extensions of track into a beet sugar plant and placing numerous switches into beet sugar farms. This money was furnished by the late Luther Allen, president of the company, who died a short time later. Recently it was planned to sell the road to other interests, and an option was taken on the property by Detroit people at $15 per share. At the time the stock had been selling for more than this and as the result of a Toledo broker putting out the statement that the stock was at least worth $25 a share, a number of the stockholders refused to give their options and the deal fell through. A week ago an option on the property was given to J. R. Nutt, of Cleveland, at $6.25 a share, Mr. Nutt specifying, however, that he must secure all of the stock. The floating debt of the company is equal to $21 per share on the stock, for which the stockholders are liable. The stockholders are also liable under the double liability clause of the former Ohio law under which the company was incorporated. It is believed, therefore, that Mr. Nutt's proposition will be accepted, and that the Cleveland people will bring about a reorganization. It is unfortunate for the stockholders that the embarrassment should come at this time, because the property is said to be making good gains, and the prospects of a Western connection with Indiana roads seem quite promising. This, of course, will greatly increase the earnings.

PHILADELPHIA RAPID TRANSIT COMPANY LEASES TWO ROADS

The Philadelphia Rapid Transit Company has leased for a long term of years the street railway properties owned by the Philadelphia, Morton & Swarthmore Street Railway Company and the Media, Middletown, Aston & Chester Electric Railway Company. These roads consist of about 25 miles of standard gage tracks. Until the lines have been thoroughly overhauled and refitted they will be operated independently, but steps are under way to establish a through car service between Front Street and Delaware Avenue (Philadelphia) and the towns of Media and Chester. The leases run for a term of 999 years each, and are based upon a sliding scale of the earnings of each road. What percentage is to be paid was not disclosed.

The Philadelphia, Morton & Swarthmore Company has capital stock of $600,000, of which $250,000 has been issued. It has a funded debt of $500,000, and it owns 16 miles of track fitted with 70-pound steel rails. The officers of the company are: President, Lewis G. Levick; vice-president, W. S. Hammett; secretary and treasurer, E. J. Hasse; directors, L. J. Levick, F. W. Hammett, E. J. Hasse, B. G. Jones and D. Wallerstein, Philadelphia; W. S. Hammett, Jersey City, and E. A. Hopkins, London, England.

The Media, Middletown, Aston & Chester Company has capital stock of $250,000, of which $205,300 has been issued. It has also sold $210,000 first mortgage 5 per cent gold bonds, redeemable in 1933. This company is owned by the same financial interests as the first-named corporation, and it operates that corporation's road under lease. Its officers and directors are the same as those given above.

NEW ROADS OUT OF ST. LOUIS

The Hillsboro, Kimmswick & Northern Railway Company has been chartered to build an electric railway from a connection with the United Railways Company's lines at Jefferson barracks to Hillsboro, Jefferson County, Mo., a distance of 23 miles. The company is capitalized at $300,000. The incorporators are: Chas. A. Gutke, H. W. Gutke, Anthony F. Furrer, James J. Ring, Charles F. Crane and Lee A Hall.

Another railroad is projected to Hillsboro and to the south. The promoters of the St. Louis, Hillsboro & Southern Railway, recently chartered, say they are soon to begin the construction of that line. It is understood that a right of way has practically been secured and that the project is or can be financed in a short time. H. M. Bowen, superintendent and general manager, who has the work in hand, is now in New York on business pertaining to the road.

According to a member of the company, the chartering of the Hillsboro, Kimswick & Northern Railway does not conflict in any way with the St. Louis, Hillsboro & Southern, as each has its right of way along different routes. The plan to build an electric railroad from St. Louis through Hillsboro to the south has been on foot for several years. Thomas Sneed once organized a company to build one, but his scheme fell through. Among the men back of the St. Louis, Hillsboro & Southern project are H. M. Bowen, president and general manager; H. D. Brandt and Samuel Winter. It is said both roads will connect with the proposed amusement enterprise and sanitarium at Montesano Springs.

LAKE SHORE ELECTRIC TO BUILD NEW BRANCHES

The Lake Shore Electric Railway Company, which recently formed the Sandusky, Fremont & Southern Railway Company to build a branch line from Sandusky to Fremont, has decided to extend this line south from Fremont to Fostoria or Tiffin by means of a spur line. The new lines will add about 55 miles to the Lake Shore Electric system, and will cost about $1,500,000. The proposed extension is a very important link in the great system of this district. The Fremont-Fostoria line would be in the direct route between Cleveland, Indianapolis and Dayton, and if this were built at the present time, it would save about 60 miles between Cleveland and Dayton. The Tiffin line, in connection with lines building, would afford a through route to Columbus. The Lake Shore people have been negotiating with Judge Bunn, of Tiffin, who owns a right of way from Tiffin to Fremont, and it is probable that this right of way will be used.

The Lake Shore Electric has sold $500,000 of first mortgage bonds of the Sandusky, Fremont & Southern for the purpose of building the Sandusky-Fremont section. The bonds bear interest of 5 per cent, are for thirty years, and both principal and interest are guaranteed by the Lake Shore Electric.

The Lake Shore Company has arranged for a mortgage of $2,000,000 for the consolidation of the Lorain Street Railway and the Avon Beach & Southern Railway. Of this amount $750,000 will be reserved for underlying issues and $500,000 will be sold to pay for the Avon Beach & Southern and the purchase of the Lorain Street Railway. It is probable that this fall these properties will be merged with the Lake Shore Electric. The company has spent about $200,000 in improving the Lorain Street Railway during the past few months. The Lake Shore has also arranged for the sale of $500,000 of general mortgage bonds to pay for improvements on the main line. This includes the purchase of ten new cars, double tracking between Cleveland and Lorain, the addition of a 2500-kw unit at Beach Park power station and the erection of a new sub-station for the east end of the road.

A TERMINAL STATION PROPOSED FOR BUFFALO

A terminal station is proposed for the electric railway lines centering in Buffalo. This is the announcement made by President Pierce, of the International Traction Company. The building will be located on a site yet to be selected, somewhere between the Terrace and Genessee Street, and within two blocks of Main Street, and will be completed within two years. Facts in regard to the project other than these are not available at this time.

PROGRESS IN ELECTRIFYING THE CABLE LINES IN THE "LOOP DISTRICT," CHICAGO

The changing over of the cable lines to electricity and the erection of trolleys over all the other tracks in the "Loop District" of Chicago is being pushed with all possible speed. Both the Union Traction Company and the Chicago City Railway Company have night and day gangs at work. The first work done by the Union Traction Company was to put up trolley on Adams Street, between Fifth Avenue and State Street. Heretofore the electric cars have been pulled by horses to and from Fifth Avenue. Work on Adams Street was completed Sunday, July 1, and cars were operated on it the following day. Work was then begun on Dearborn Street, and in a few days the Sedgewick Street cars, which were previously hauled by horses from Lake Street to the Polk Street depot, were operated over Dearborn Street by electricity. Work is now being pushed on the Blue Island Avenue cable line. As rapidly as possible the Milwaukee Avenue, the Madison Street cable lines and the North Side cable lines will be trolleyized, the work on each line being taken up in the order given. At the company's shops, the best cable cars are being converted into single-truck electric cars by the substitution of new trucks and the installation of wiring. In all, about 300 cars will be changed over. The first work done towards electrification of its lines by the Chicago City Railway is the erection of trolley wires on State Street as far south as Eighteenth Street, which will obviate the Archer Avenue electric cars being trailed through the down-town district behind cable cars.

TRANSPORTING TROOPS BY TROLLEY IN MASSACHUSETTS

The Boston & Worcester Street Railway Company, the trolley air line, on Saturday, July 7, transported twelve companies of infantry, the headquarters staff, band and drum corps from Chestnut Hill to the State musterfield at South Framingham, taking them in special open cars. This is the first time that an entire regiment has been transported by trolley to the musterfield, and the officers and men expressed themselves as highly pleased with the service. Arrangements have been made to transport the entire 5th Regiment, which comes from Boston, the same way. On Saturday, July 14, the company will take the regiment back from the musterfield to Chestnut Hill in fifteen open cars. The friends of the soldiers flocked to the musterfield on Sunday, and the Boston & Worcester increased the service to accommodate the traffic. The trip from Boston to the State camp is 20 miles, and the running time about 1 hour.

MEETING OF NEWMAN PROPERTIES ASSOCIATION

The semi-annual meeting of the Newman Properties Association, among whose members are numbered the electric railway and light properties controlled by the Newman interests, convened at the Imperial Hotel, Knoxville, last week. Some fifty or sixty delegates were present for the three days' session. President Jamison called the meeting to order, and after temporary organization and roll call an adjournment was taken for lunch. On the afternoon of the first day the subject, "Economical and Efficient Force for Car Barn and Shop Operation," was discussed by A. D. McWhorter, of Memphis, and C. J. Kendal, of Little Rock. "From Coal Pile to the Meter, an Analysis of Our Losses," was the next subject. This was discussed by J. A. Emery, J. P. Brown and William H. Chapman. "Some of the Difficulties of the Accounting Department" was discussed by W. J. Tharpe and H. C. Walters. "Keeping Down Operating Expenses" was discussed by C. H. Harvey, president of the local company, and E. W. Ford. Other subjects on the program were: "Preventing Accidents," H. A. Davis, E. R. Roberts, Geo. H. Harris; "Fighting Damage Suits and Claims," D. H. Cantrell, T. H. Tutwiler and C. A. Avant; "Our Meter Department, Its Organization and Operation," F. V. Underwood and J. E. Spike; "A Wideawake Purchasing Agent and His Methods," Chas. T. Doerr, C. O. Simpson; "Car Painting, How It should Be Done and How Often," W. A. McWhorter and George Swint; "Net Earnings from Park and Excursion Travel, How Much Can We Afford to Spend to Encourage Such Business," T. C. Kelley and J. A. Emery; "How Low Can and Should we Sell Current for Power?" William E. Chapman, J. M. Bradley and P. E. Mitchell. The following are the delegates who were present at the sessions: Robert Jamison, president, Birmingham; C. O. Simpson, vice-president, Little Rock; H. T. Bunn, secretary, Knoxville; L. H. Sherk, H. M. Bugler and C. M. Carry, New York; J. A. Emery, George H. Harris, W. A. McWhorter, A. M. Bradley, F. V. Underwood, C. A. Avant, Chas. T. Doerr, J. M. Ritson and Hugh Morrow, Birmingham; Percy Warner, H. A. Davis, J. P. W. Brown, N. P. Yeatman, H. C. Walters, George Swint and George D. Mills, Nashville; T. H. Tutwiler, E. W. Ford, W. H. Burroughs and C. B. Proctor, Memphis; J. H. Phillips, W. J. Tharye, E. Rick, J. Fry and C. J. Kendal, Little Rock; W. H. Chapman, W. W. Reed, Robert Duerer and Wm. M. Connelly, Houston, Tex.; C. H. Harvey, P. E. Mitchell, T. C. Kelly, Loeb Fender, E. R. Roberts, J. M. Kingston and J. E. Spike, Knoxville. Officers were elected as follows: President, Charles H. Harvey, Knoxville; vice-president, T. H. Tutwiles, Memphis; secretary and treasurer, W. J. Tharpe, of Little Rock.

COMPLETION OF THE ELECTRIC SERVICE SUPPLY COMPANY'S ORGANIZATION

The Electric Service Supplies Company announces the completion of its organization. By the purchase of the business of the Mayer & Englund Company, of Philadelphia; of Porter & Berg, Chicago; Garton-Daniels Company and Electrical Devices Company, Keokuk, Ia., it acquires all the assets and assumes all the liabilities of said companies. With increased capital, enlarged manufacturing and warehouse facilities and a united corps of executive and sales representatives, the new company earnestly solicits a continuance of the very liberal support accorded its predecessors.

ACTION POSTPONED ON BRIDGE LOOP PROPOSAL

The question of an elevated connection in New York between the Williamsburg and the Brooklyn bridges will not be considered again until the fall. The date set is September 28. This decision was reached at a meeting of the board of estimate of the city held last Friday. As has been stated previously in the Street Railway Journal, the idea is to facilitate transit by looping cars between the bridges and picking up Brooklyn passengers en route rather than to deal with passengers in the mass, as is now done at both the Williamsburg and Brooklyn Bridge terminals. The elevated plan, proposed by Bridge Commissioner Stevenson, has met with almost universal endorsement by Brooklynites. In opposition to the plan are New York interests who seem to see in the plan only a further encroachment upon streets already congested, and for the most part narrow. They favor an underground connection. President Winter, of the Brooklyn Rapid Transit Company, has said that as far as his company is concerned the proposal for a subway is out of the question. In a statement which he made a few days ago, he set forth his reasons for his opposition to the subway proposal as follows:

"The operation of a subway connection would involve conditions practically out of the question with this company. Aside from the objections to operating heavy grades on less than one-minute headway, which have been repeatedly explained, such an arrangement would call for the replacement of all of the elevated cars by others specially adapted to subway service. These, in turn, as I am informed by electrical engineers, would require a character of motor equipment which, together with the cars, would, on account of the great weight, require the practical reconstruction of the elevated structure which is now in a condition to carry the heaviest trains required in elevated service, the whole involving an expenditure of many million dollars.

"We have the greatest desire to assist to the utmost within our power, in relieving the bridge terminal conditions in Manhattan, but these objections are so serious as in our judgment to practically eliminate the subway plan from any scheme in direct connection with bridge operation."

OCEAN SHORE RAILWAY GRADED BY EARTHQUAKE

As previously noted in these columns the earthquake of April 18 damaged the roadbed of the Ocean Shore Railway, of San Francisco, to some extent by filling in excavations and throwing the grade out of alignment in one or two places. It appears now, however, according to J. B. Rogers, chief engineer of the company, that the road was also actually benefited by the earthquake to the extent of $15,000. Along the strip of coast country known as Mussel Rock Bluffs, he says, the Ocean Shore road was progressing nicely with the work of grading its roadbed when the earthquake came along and accomplished in a few seconds what the company would have taken weeks and the expenditure of many thousands of dollars to accomplish. The bluffs in question were very precipitous, and in order to secure roadbed for the electric line half way up the bluffs it became necessary to remove thousands of yards of overhanging rock and earth. This was to be accomplished by boring from above and putting in heavy charges of blasting powder. The earthquake, he says, shook down an immense amount of material, and did the work much better than it could have been done by blasting. Where a precipitous bluff stood before the earthquake, there is now a sloping hill that can be graded with comparatively little expense. Rogers says that this offsets probably half the damage which the road sustained in other places.

Regular passenger service was inaugurated on the southern end of the Ocean Shore Railway on June 15, when a special excursion of business men went over the road from Santa Cruz to San Vicente. Two trains a day will be used on the 12-mile run for the present. Construction work on the Ocean Shore Road was commenced last September, and the management expects to have through trains running between Santa Cruz and San Francisco one year from this date. The first section of the track is in good condition, the return run from Wilder's Station to Santa Cruz, a distance of 4 miles, being made in 5½ minutes. Three steam shovels and 300 men are at work on this section of track reducing grades and filling trestles.

OUTING OF NEW YORK CITY EMPLOYEES

The ninth annual outing and games of the employees of the Broadway, Columbus, Lenox, Seventh and Sixth Avenue divisions of the New York City Railway Company were held at Donnelly's grove, College Point, L. I., on Wednesday, July 4. The steamer "Richmond," carrying the party, left the foot of West Fiftieth Street, New York, at 9 o'clock.

INTERBOROUGH-METROPOLITAN OFFICERS

The first official list of the officers and directors of the Interborough-Metropolitan Company appears in the application to list the securities of the new corporation, which application has been approved by the governing committee of the Stock Exchange. The officers of the company are: August Belmont, president; Charles A. Conant, E. Mora Davidson and W. J. B. Mills, vice-presidents; J. K. Corbiere, treasurer; James I. Burke, assistant treasurer; H. M. Fisher, secretary; John F. Buck, James I. Burke and G. E. Little, assistant secretaries. The following temporary vice-presidents and assistant secretaries have also been appointed: Vice-presidents, August Belmont, Jr., A. Birtner, B. Hamburger, William Cahill; assistant secretaries, W. C. Wells, Louis Neilson and W. H. Raab. The following are the members of the board of directors: Joseph S. Auerbach, August Belmont, Edward J. Berwind, Paul D. Cravath, John D. Crimmins, E. Mora Davison, Thomas P. Fowler, Andrew Freedman, Solomon Guggenheimer, James Jourdan, Gardiner M. Lane, John B. McDonald, De Lancey Nicoll, Walter G. Oakman, Morton F. Plant, Thomas F. Ryan, Robert A. C. Smith, Cornelius Vanderbilt, George W. Wickersham, Peter A. B. Widener and George W. Young. The members of the executive committee of the company at the present time are as follows: August Belmont, Edward J. Berwind, Paul D. Cravath, Andrew Freedman, James Jourdan, Walter G. Oakman, Thomas F. Ryan, Cornelius Vanderbilt and Peter A. B. Widener.

The company's securities placed on the regular list of the New York Stock Exchange are: Sixty-seven million four hundred and six thousand dollars of the $70,000,000 collateral trust 4½ per cent gold bonds, $45,284,600 of the $55,000,000 5 per cent cumulative preferred stock, and $92,260,100 of the $100,000,000 common stock. The remaining amounts of the securities of the three classes, which the committee on stock list are authorized to add to the regular list from time to time, represent securities of the Interborough Rapid Transit Company, the Metropolitan Street Railway Company and the Metropolitan Securities Company not yet turned in by their owners for exchange into securities of the Interborough-Metropolitan Company.

CLEVELAND TRACTION SITUATION

The Cleveland Electric Railway Company has abandoned all attempts to negotiate with Mayor Johnson on the street railway franchise situation, and in a communication this week to the City Council the company announced that it would shortly present a formal proposition for a renewal franchise grant on the basis of a material reduction in fare. It is generally believed that this proposition will be on a basis of seven tickets for a quarter with limited transfers.

The Cleveland Electric Railway Company has acquired by purchase the right to construct a line on Gordon Avenue, which street is being sought for by the new company as a route for a cross-town line. It appears that the original owners in dedicating the street to the city retained an ownership of 12 feet on each side of the street and the old company now acquires these rights. The city promises to contest this claim.

The Cleveland Electric Railway Company has received in a formal manner, and is now considering, the proposition to lease the property made by a syndicate headed by Henry Everett, who formerly controlled the road. The terms of the proposition have not been made public, but is understood to be on the basis of guaranteed dividend for the stock.

The Municipal Traction Company, which has acquired by lease the property and franchises of the Forest City Railway Company, has announced the following management: A. B. Du Pont, of Detroit, president and general manager; W. B. Colver, secretary; Fred C. Alber, assistant general manager, and Edward Widenson, treasurer. The new company is pushing construction work with large forces in several parts of the city. A site for a power house has been selected and it is stated that contracts for the equipment are to be placed at once. Contracts for cars are said to have been closed, but the car builders in Cleveland say that they know nothing of the order. It is announced that no car houses will be built by the new company, but that cars will be stored out of doors.

The Forest City Company has just applied to the Council for franchises over twelve routes in various parts of the city. These will have to be open for competitive bidding, and the Cleveland Electric has expressed its intention of submitting proposals over some of the routes. Officials of the Forest City Company claim that the first offering of $400,000 stock of the new company has been oversubscribed. Mayor Dunne, of Chicago, was one of the subscribers. The "Cleveland Press," a sensational sheet, has taken the unusual step of announcing that it has investigated the proposition of the new low fare company, and in a formal manner offers to guarantee the 6 per cent interest on the stock of the new company, and to buy the stock at cost and accrued interest at any time within two years, to all who subscribe through the publisher of the paper. This has had the effect of bringing in many subscriptions for one or two shares.

The city authorities and the Cleveland Electric Railway Company are likely to get into court over the question of paving the devil strip on Broadway. The city claims that the company is obliged by franchise to pave the devil strip. The company denies this, but offered to pave the strip with brick which had been taken from other streets. It started to do this, and the city stopped the work. The city retaliated by attempting to prevent the Akron-Cleveland Interurban cars from entering over this route. The city solicitor, however, has advised the authorities that they have taken the wrong course, and that they could only bar the interurbans on the question of the weight of the cars showing their tendency to injure the pavement. This, of course, would prevent all interurbans entering the city. At its meeting a few evenings ago the Council received a resolution revoking the franchise of the company on Broadway. The contest hinges upon the meaning of the clause covering the question of paving between the track. The clause says: "The company shall pave and maintain the pavement in the space included between the outer lines of the two rails of each of its tracks." There are several important routes on which the conditions regarding pavement are the same as this one, and the settlement of this case is of considerable importance to the company.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JULY 3, 1906.

824,765. Fender; Robert S. Watson, Bay City, Mich. App. filed Oct. 28, 1905. Details of construction.

825,833. Trolley; Joseph Tetlow, Saco, Maine. App. filed Nov. 7, 1904. A removable tread is provided and the flanges of the wheel are held in contact therewith by spring pressure. The wheel has ball bearings, which are adjustable to compensate for wear.

824,834. Trolley; Joseph Tetlow, Saco, Maine. App. filed April 19, 1905. Relates to modification of the preceding patent, and particularly to the method of supporting the removable tread of the wheel.

824,845. Rail-Bond; Walter G. Clark, Seattle, Wash. App. filed Oct. 13, 1905. A single piece rail-bond formed of a flexible body having integral end portions which are flattened and each provided with a plurality of perforations.

824,873. Lubricator; Eugene R. Keefe, Bellows Falls, Vt. App. filed April 4, 1906. A lubricant receptacle mounted adjacent the car wheels, has a feed-wheel passing through a slot in the receptacle, and means whereby said feeding wheel may be brought into contact with the flanges of the car wheels by the lateral movement of the car body when rounding curves.

824,986. Car Fender; Benjamin B. Jenkins, Toronto, Canada. App. filed Sept. 27, 1905. Details of construction.

825,130. Amusement Apparatus; Johann Jurgens, New York, N. Y. App. filed Nov. 6, 1905. A pleasure railway consisting of a platform having auxiliary outgoing and incoming platforms, an endless track arranged surrounding the platform, and cars moving from the platform over the track and surmounted by gondolas to which a rocking motion is imparted.

825,142. Trolley Harp; Hermann Mangold, Carnot, Pa. App. filed Nov. 10, 1905. A pair of discs are revolubly supported on the harp so as to extend over the top of the wheel and prevent the escape of the conductor therefrom. In passing hangers the discs are laterally displaced.

825,172. Railway Track Structure; Victor Angerer, Ridley Park, Pa. App. filed April 26, 1906. A track structure having arms, a rail mounted in the space between the arms, spacing blocks, and means for drawing the rail firmly in contact with the spacing blocks.

825,236. Cable or Wire Hanger; Richard C. McKiliget, New Orleans, La. App. filed Sept. 27, 1905. Two jaws are connected by a strap which is passed around the trolley conductor. When the two jaws are forced together by a suitable nut, the strap is tightly bent around the conductor to hold the same in place.

PERSONAL MENTION

MR. J. E. FEIGHT retired on July 1 as general manager of the Dayton & Northern and the Dayton & Muncie Traction Companies, as these roads passed into the hands of the Schoepf syndicate on the date mentioned.

MR. JOHN N. OSBORNE, formerly agent of the Wabash-Lackawanna Despatch in Toledo, has been appointed general freight and passenger agent of the Toledo, Port Clinton & Lakeside Railway, with headquarters in the Gardner Building, Toledo.

MR. WILLIAM R. ALBERGER, formerly of the Santa Fe Railroad in San Francisco and president of the Transportation Club in that city, has been appointed traffic manager of the San Francisco, Oakland & San Jose Railroad, commonly known as the Key Route.

JOHN A. KAISER, formerly foreman of the railroad shops of the Pennsylvania Railroad Company, at Todd's Cut, has been appointed superintendent of the electric line to be opened by the West Jersey & Seashore Railway Company from Camden to Atlantic City. The line will open this month.

MR. W. B. TARKINGTON, superintendent of the Detroit, Monroe & Toledo Short Line, has resigned, and Mr. E. B. Taylor, Jr., at present superintendent of the Detroit City lines of the Detroit United Railway, has been appointed to the place. The office of assistant superintendent of the Short Line has been created, and Mr. Murdock McCauley, at present superintendent of the Orchard Lake division of the Detroit United, has been appointed to the position. Mr. McCauley will have his headquarters at Monroe, while the new superintendent will be located in Detroit. It is understood that Mr. Tarkington will go with the new line building out of Chicago, in which Mr. Mathew Slush, formerly president of the Short Line, is interested.

MR. GEORGE C. TOWLE, formerly manager of the Syracuse & South Bay Railway Company, has been appointed by the American Railways Company to assume the management of the Peoples' Street Railway, of Dayton, succeeding the late Mr. Joseph L. Breen, who met with a fatal accident while in the performance of his duties some months ago.

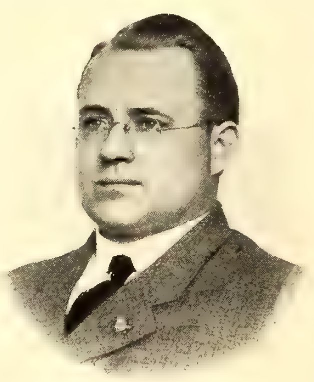
MR. VALENTINE WINTERS, president of the Dayton & Western Traction Company, who has retired from active interest in the electric railway business through the leasing of his property to the Schoepf syndicate, will devote his attention to the banking business in Dayton, succeeding his father as president of the Winters National Bank of that city.

MR. WALTER A. PEARSON, formerly electric engineer for the New York City Railway Company, has been appointed chief engineer of Electric Development Company and Toronto-Niagara Power Company. Mr. J. W. Putnam, superintendent of lines and feeder of the New York City Railway Company, will take charge of transmission lines under Mr. Pearson.

MR. C. M. PAXTON has been appointed general manager of the Dayton & Troy Electric Railway Company and the Piqua Street Railway Company, of Piqua. He will have his headquarters at Tippecanoe City, Ohio. Mr. Paxton is a young man who has made an excellent record in the traction business in the last four years, having advanced from bookkeeper in the offices of the Dayton & Troy to the offices of auditor, traffic manager, secretary, and now general manager.

MR. GARDINER C. SIMS, having recently been elected to the presidency of the William A. Harris Steam Engine Company, of Providence, R. I., builders of Corliss engines, has resigned his position as general manager of the Marine Engine & Machine Company, of Harrison, N. J., and will return to Providence to assume his duties there. The William A. Harris Steam Engine Company has purchased a large tract of land at Central Falls, R. I., and plans are now being prepared for the building of new works.

MR. THOMAS K. BELL, chief engineer for William Wharton, Jr., & Company, Inc., of Philadelphia, has resigned this office to accept the position of chief engineer for the Interstate Railways System. Mr. Bell has been associated with the Wharton Company for thirteen years, and for the last four years, as chief engineer of the company, has had full charge of all its engineering matters. Mr. Bell began his business career with Isaac A. Shepard & Company, iron founders, of Baltimore and Philadelphia, and retained this connection for eight years, passing through the various branches of the iron industry and serving his apprenticeship as a practical iron moulder. After this experience he completed a course at Maryland Institute, graduating in 1890. After graduation he spent one year with the Pittsburg Locomotive Works, in general engineering work, and then one year with R. D. Wood & Company, of Camden, N. J., on special hydraulic tool and machine work. In 1893 he entered the employ of the Wharton Company as draughtsman, and in 1899 was made chief draughtsman. About 1904 he was made chief engineer of the company. In this capacity Mr. Bell has established an enviable reputation and is a recognized authority on design and construction of special work and permanent way, both for steam railroads and electric railways. As chief engineer of the Interstate Railways System, Mr. Bell will have general charge of about 430 miles of track, comprising properties located in Trenton, N. J., Norristown, Pa., Reading, Pa., Wilkesbarre, Pa., Wilmington, Del., as well as a number of other important city and suburban lines in Delaware, Pennsylvania and New Jersey. One of his first responsibilities will be thoroughly to overhaul the properties at Trenton. Mr. Bell's permanent headquarters after Sept. 1 will be in the Merchant & Marine Building, Philadelphia, but he will open temporary offices in Trenton while the construction work is in progress in that locality.



T. K. BELL

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Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 237,100 copies, an average of 8176 copies per week.

Efficient Line Cars

We recently heard a party of managers of high-speed interurban roads discussing the subject of the most desirable type of line car for a long road. One manager of a 50-mile road said he had three small single-truck cars and used two men on a car. A manager of a 300-mile system said he had eight line cars which were all old obsolete passenger or express cars unfit for regular train service and had been fitted up for line work. Others spoke along the same strain, and the usual practice seemed to be to have one line car for about every 25 to 35 miles and keep two men on a car. A manager of a progressive line in Western Ohio said that he had tried this plan, had finally relegated his old line cars to the scrap heap, and had built a car especially designed for the service. He made it the fastest car on his system and placed in it four good men, higher priced men than he had formerly employed. He kept these men in this service exclusively, ready for any emergency, and the car takes care of 100 miles of road without any assistance. He found that his lines were kept in better repair, that repairs were made more quickly and cheaply than before, in spite of the longer distances which the car has to travel, and that the scheme was in every way more satisfactory than the plan of using slow-moving, obsolete equipment. He pointed out that steam roads pay a great deal of attention to their wrecking equipment. They employ plenty of men to do the work quickly, and when a wreck occurs they use on the wrecking train the fastest locomotive that is available. In fact, many roads have trains made up and ready at all times for such emergency work.

Transfers and Transfer Systems

We wonder whether the general public will ever come to realize the amount of thought and money expended in any large traction system upon the matter of transfers. To the passenger it seems very simple. Granted that he is entitled to transfers at all, a universal transfer given whenever and wherever he wants it seems about the right thing, and if he does not get it there is a kick coming. From the standpoint of the company there are two distinct classes of transfers—those that represent the proper continuation of a five-cent ride and those which are in the nature of a discount to the public, by extending the five-cent limit far beyond the customary limits. It would be a very instructive thing if these two classes could be separated, and we fancy that in many cities the proportion of the class last mentioned would be surprisingly large. It very often happens that by taking full advantage of a transfer system the passenger gets his ride on the basis of a third of a cent per mile or even less, a figure far below anything that could reasonably be expected. Of course such cases are in the minority or no road could stay in business at all. On the other hand, many transfers are given for use within entirely reasonable limits and under circumstances which the road can well afford.

There is a frequent cry for universal transfers from any line to any other line. On some systems such transfers could be granted without serious loss, inasmuch as the only connections may be for relatively short runs. If, however, a city has a really well-developed rapid transit system, there will inevitably be crossings where long-distance connections are made which would extend the five-cent ride beyond all reason. The American single-fare system has been of immense benefit by helping the growth of suburbs. Do not ride a free horse to death by making unreasonable demands, for this exterior traffic is light and costs money to maintain. Almost every system has crossings forming long closed loops, and unless transfers are restricted there is no practicable way

of preventing circuit riding which would rise during the summer to formidable proportions, and even with existing transfer systems this is rather difficult to prevent.

Even in case of transfers to legitimately connecting lines there is good reason, quite apart from considerations of fare, for exercising discretion in the granting of transfers. It is of the utmost importance in reducing congestion to avoid massing traffic at a single point or on a single line. If transfers are unlimited it is exceedingly difficult so to control traffic as to distribute it along the lines of least resistance. Guiding it in definite directions may often improve the situation greatly, and thus be of profit to the city at large. Limitation of transfers often enables this to be done when it would be impracticable by any other means. A company should also be permitted to make reasonable regulations to protect itself against fraud, and where the number of short-distance riders is large a rule requiring the passenger to ask for his transfer when he pays his fare is certainly not unreasonable.

As to methods of transfer there seems to be a wide difference of opinion. Bodily transfer, as in the case of elevated roads and subways, is of course the simplest and most convenient when it can be accomplished. On surface lines it is generally out of the question, and the choice lies between transfer men stationed at definite points and the issuance of transfer slips by conductors. The latter gives perhaps the best control of transfers, but proves to be very troublesome on lines where there is a great demand for transference. The roads in large cities use a combination of the two, while those in smaller cities confine themselves to tickets. There are cases, too, where a coupon transfer can be advantageously used to check indiscriminate issuance of one transfer upon another. This would also have the advantage of keeping a certain check upon the whole system, and would enable some idea to be gained as to the distribution of traffic upon the longer and more troublesome routes. The whole subject is one that could be studied to advantage, and upon which valuable statistics could be gathered. The universal transfer idea has gained popularity with the public for obvious reasons, and street railway men should be able to meet it with the plain facts showing the necessities of the case. It may be true in a given instance that a certain scheme of transfers has resulted in the loss of many legitimate fares, but it is difficult to make good the contention without an analysis of the situation for which data are not at hand. We believe, therefore, that it would be good policy so to develop the transfer system as, if possible, to give a clear idea of the relative amounts of the two classes before referred to as a measure of self-defense and of education of the public. Time and money are well spent in doing this, for a single improper transfer point forced upon a company may mean a serious loss of revenue which might be avoided.

Corrugations in Rails

This subject has attracted some attention in this country but much more in England, and a considerable portion of the recent report on street railway conditions and practices in America by A. L. C. Fell, chief officer of the London County Council Tramways, was devoted to this subject. This report was digested in our issue of Feb. 3. Since that time the Tramways and Light Railways Association of London has continued the investigation, and in its June circular has presented a very interesting account of rail corrugation on the steam railways in India, where the evil seems to exist in an acute form. So much has been said and written upon the subject that it is merely necessary to call attention, here, to the salient features of the troubles. Rail corrugations, then, appear as vertical indentations on the head of the rail, of greater or less regularity, length and pitch, and of depths that range from a barely visible spot too shallow to be measured to cavities of a quarter of an inch in depth. The obstacle arising to the off-hand solution of the problem lies in the fact that observations have thus far been confined to the location and extent of the trouble, and a guess at the cause without any systematic investigation as to the action of the rails themselves and the cars at the point where corrugations occur. As in all cases where the whole story is not known, the evidence is conflicting, contradictory, and seems to show that there is no law governing the phenomenon. In other words, there may be a number of causes or natural laws which are suffering a perversion; the first of which is improbable and the second absurd.

The data at hand tell us that corrugations occur on steam lines of England and the United States to a slight extent; to such an extent in India as to be serious, and on electric roads in both England and the United States in a way to be common and troublesome. They occur on a wide range of rail section, weight and chemical analysis, and are confined to those of no one mill or method of manufacture, and on double and single-track lines; they appear in cuts or fills, on ascending and descending grades; they are said to be most pronounced in damp climates, but upon this point evidence is short and inconclusive; they are not limited to points where brakes are regularly applied, but do seem to develop most rapidly at those points, though many contradictions to this statement can be found.

In the way of contradictory observations, one man tells us that there is a difference in hardness of the high and low points of the corrugations, in that the former can be cut with a file and the latter cannot, while another says that there is no difference in the hardness of the two points; in reality, neither seems to have made an examination of sufficient thoroughness to entitle his statement to acceptance. Finally, so far as physical, chemical and microscopical examinations of the rails are concerned, there is nothing to indicate the cause.

Of course, theories on the subject have been propounded without end, and they are almost as numerous as the men who have thought and written upon the subject, each being supported by a part of the data at hand though not by all. It reminds one of the statement made by an engineer who was recently investigating the causes of sharp flanges on a certain road. When he had been at work for a few days and was asked as to how he was getting along, he said that he had accumulated such data that by a proper selection he could prove almost any theory that might be promulgated. So by a selection from among the observations on corrugated rails, it has been suggested that they were caused by rust, by irregular cooling or annealing after rolling, by the use of ingots too cool to permit of proper rolling, by the brakes, by skidding wheels, by excess of manganese, by alternate laminations of pearlite and ferrite, by rolling at improper temperatures, by some peculiarity of ballast, and by vertical vibrations set up by passing vehicles.

It hardly seems possible that variations in chemical composition or microscopic structure can be the responsible cause, nor yet the suggested variations in manufacture, else the phenomena would be more common. Nor is it probable that the use of brakes is the primal cause of the difficulty, because it has been found at points where the brakes are never applied, though it is quite probable that, given the real first cause, the brakes may lend material assistance in the development. The point is to find some possible cause that invariably accompanies the phenomenon, run it to earth, then remove it at the point where the trouble has occurred and note whether it disappears. Until this is done, either by a systematic investigation or by the tentative process of trial and error, we will continue to guess.

Possible Causes of Corrugation

From what has thus far been said it is evident that we are in the air as to the real cause, and while it may be the mere setting up of a man of straw for others to knock down, a suggestion can be made as to the most promising field for investigation, and that is along the lines of vertical vibration.

First let us consider the prevalence and the evidence as to location. As already stated, the corrugations occur to a much greater extent on electric than on steam roads. In India, where the steam roads have had much more difficulty than elsewhere, it is reported that it is almost invariably developed where the track is packed and boxed with brick or burnt clay ballast and on open girder bridges; it scarcely ever occurs where the ballast is of stone, and never where the track is packed or boxed with earth. On steam roads it is most apt to occur at stations. It apparently does not appear as frequently in the open country on electric roads as in towns and on elevated structures. From this it seems as though this condition of ballast and track laying might have an important or even controlling influence in the development of the corrugations.

Now let us consider the subject of vertical vibrations. In the adjustment of springs to the carrying of cars there is one recognized principle that should be borne in mind, but which is frequently overlooked. It is the cause of that peculiar rough riding that so frequently appears in all cars. They may be running with great smoothness when for no apparent reason they will commence a disagreeable vertical vibration. The cause for this is to be found in the fact that for every weight of car and combination of springs that may be placed beneath it there is a fixed natural rate of vibration like that of a pendulum. A blow at a joint may start it, and then, if the speed of the car is such that the blow at the next joint synchronizes with this rate, the amplitude of the vibration will be increased, and increased again at the next joint until the disagreeable results indicated are obtained.

Now as to the track. An observation of almost any double-track road will show a depression on the receiving rail at a distance of from eight to fifteen inches from the joint, showing that the yielding of the joint causes a blow of some sort to be delivered to the rail head on beyond in the rigid portion of the rail. This is especially true of high-speed service, the distance of the depression from the joint increasing with the average speed of the service. Such depressions are not common, however, on continuous, welded track, though the evidence is that corrugations are apt to start with a point of maximum depression at a joint and run out as they leave it, only to start again at another joint.

As to what the actual conditions of car vibrations and rail deflections may be we do not know, but an inference at least can be drawn as to the former. We know what occurs in the case of the car body. At the wheels the pressures are the resultant of a number of composite forces. Experimental data have shown that the stresses put upon a truck bolster are from 25 per cent to 50 per cent in excess of the static load with applications of the same several times a second. On electric cars the motor usually rests directly upon the axle without the intervention of springs, and the nose is carried by stiff helical springs whose period of vibration is very short with a limited amplitude. If, then, these springs act in the same way as those beneath the car, and there is no reason why they should not, we will have a condition of excessive vibration whenever the rail joint, or other inequalities of the roadbed, set up a periodicity of blows that synchronizes with that of the springs carrying the motor. Whether or not this periodicity can be made to agree with the interval of passing the corrugations on the rails remains for some future investigator to determine. It can only be said by way of encouragement that it looks promising.

Reverting now for a moment to the experience of steam lines, and especially those of India, quoted in the pamphlet of the British Association, the spring suspension of the motor of course does not obtain, but it is possible that the short, light cars may have a correspondingly short period of vibration that will parallel it.

Finally, the question arises as to whether we have any data that will warrant the assumption that a periodic increase of wheel pressure will account for the depressions. Observations on the driving wheels of locomotives have shown that where there is a regular increase of pressure on the rail due to the action of the counterbalance there is an unequal wearing away of the tire, the greatest wear corresponding to the points of maximum pressure. It has also been shown that the load on the truck bolsters and inferentially the wheel pressure may be 50 per cent above that of the static load. A common weight of the present motor car and equipment is such that with a 50 per cent increase the weight on a single wheel may amount to from 10,000 lbs. to 12,000 lbs., while the torque of the motor may, at times, add 3000 lbs. to this. How much this may be increased at the wheel by the peculiar and stiff hanging of the motor is not known, but it seems quite within reason to guess that it will, at times, rise to more than 20,000 lbs. on a single wheel.

If this much be conceded then we know that a static load of 20,000 lbs. put upon a wheel is sufficient to put a distinct spot or depression on an ordinary rail. If the pressure is relieved before the wheel has moved the spot remains. If it is not removed but is continued, with the movement of the wheel, the spot is rolled out and a longitudinal crushing or wearing of the rail occurs. Hence it does appear as though the repetitions of the variations of vertical loading are quite sufficient to account for the depressions in rail corrugations, and as a consequence this is a line of investigation that is recommended to those who are financially interested in the removal of the trouble. Meanwhile, until this is done, and a demonstration as to the truth or falsity of the position has been made, the whole problem remains within the province of more or less probable guesswork in which we have found and left it.

IMPROVEMENTS AND OPERATING FEATURES OF THE SOUTHWEST MISSOURI ELECTRIC RAILWAY

The Southwest Missouri Electric Railway was one of the first interurban lines to be put into operation, and it enjoys, moreover, the distinction of not having had its organization changed since that time. The road has its origin in a mule line built in 1890, between Webb City and Carterville, by A. H. Rogers, who is now president of the system.

EXTENSIONS AND TRACK WORK

The recent development of the zinc and lead mines around Joplin, and the resulting increased traffic over the line, has necessitated quite a number of improvements and extensions. The whole region through which the line passes, that between Carthage, Mo., and Galena, Kan., is rather thickly populated, but that between Joplin and Carterville especially so. In fact, the territory is built up almost continuously, with the exception of those parts studded with zinc and lead mines. With single tracks, traffic has about reached the maximum limit. Half-hour schedules are now operated over the whole line. This necessitates passing cars every fifteen minutes, and it has been found by experiment that cars cannot be run to advantage over a single track interurban line at more frequent intervals than this. To handle the crowds, it is necessary during the morning and evening hours to run two cars, and often three cars together. Multiple-unit operation has not yet been put into practice and the cars are operated as separate sections of one train. Even with three cars every half hour, it is very difficult to handle the crowds on special occasions. These conditions have necessitated double tracking the system between Joplin and Lakeside Park, a distance of 12 miles, and this work is now practically completed between Joplin and Webb City. The track improvements involve considerable straightening and regrading of the line also. Between Carterville and Webb City the whole route will be changed, and a long viaduct built. From between Carterville and Lakeside Park much of the new track is being constructed north of the present location. The new route, while it avoids a long detour and eliminates several curves, necessitates some heavy grades in rock, which were regarded as too large to be cut down when the road was originally constructed. The grading being done at one point alone will, in fact, necessitate handling more earth than was removed in the original construction of the whole road. The expenditures for grading and changing the route between Joplin and Lakeside Park will amount to about $300,000. This, however, is regarded as a good investment, since it will cut down the time to such an extent that the schedule now being operated can be run with one car less, a grade crossing with a steam road will be avoided, and the necessity of employing watchmen will be removed.

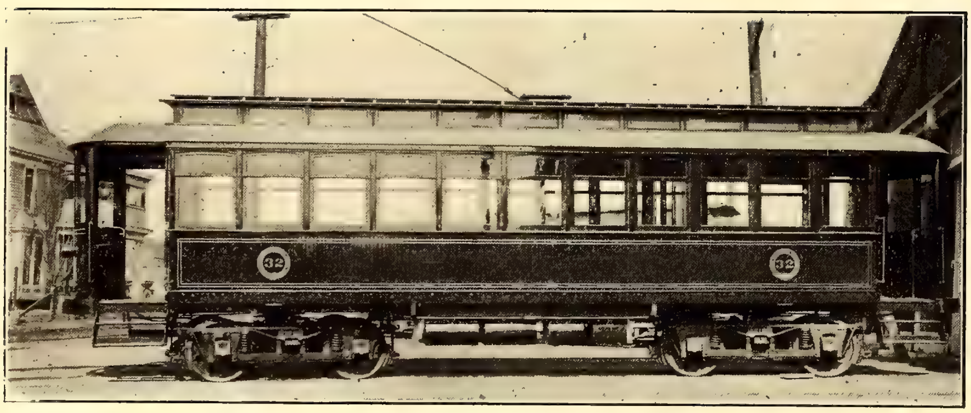


FIG. 3.—A CAR BUILT IN THE SHOPS OF THE SOUTHWEST MISSOURI ELECTRIC RAILWAY COMPANY

THE NEW LINE

The new construction work includes the building of an extension north out of Webb City through a thickly populated

FIG. 1.—BREAK IN THE LEVEE NEAR CENTER CREEK FOR MISSOURI PACIFIC SWITCH

mining district. The new road, which will be 10 miles long, will pass through a series of prosperous mining towns, Oronogo, Neck City, Purcell and Alba, varying in size from Oronogo, with 3000 people, to villages of a few hundred inhabitants. Even without railway facilities travel between the several towns is at present such that several hack lines are kept in operation. Work on the new line is well advanced. All the grading is finished and the track is practically completed from Webb City for almost the entire distance. The road is built for high-speed service. The usual handicap to speed on interurban lines, slow running through towns, has been avoided by building the line through the outskirts of the towns. Only one grade crossing with steam roads occurs, this being at Purcell. The track is laid with 70-lb. rails, using the Cambria Steel Company 100 per cent joint. With the exception of those places where the road passes over viaducts the maximum grade is 2¼ per cent, but at viaducts there

FIG. 2.—CONCRETE BUTTRESSES AND PIERS FOR STEEL STRUCTURES OVER CENTER CREEK

are some 4 per cent grades. Practically all of the road is laid on private right-of-way. In some places, because of heavy grades, it was necessary to purchase a right of way 400 ft. wide. For the greater portion of the distance the track has been laid on one side of the right of way, and poles have been set for a second track which will eventually be laid. Over

viaducts and heavy grades, however, no provision has been made for putting in the second track. Span-wire construction is used on all portions of the line. In ordinary work 35-ft. poles are employed. Telephone wires are carried on a cross arm near the top of one line of poles, while the poles on the opposite side of the track carry high tension wires as far as the sub-station located a few miles north of Oronogo, and at about the middle point of the line. An unusual amount of heavy construction work is involved in the building of the line. Some of the accompanying reproductions from photographs show the character of the work near Center Creek, which is approached on the south by a long levee. The break in the levee, shown in Fig. 1, and the heavy concrete work were necessitated by a switch from the Missouri Pacific Railroad. Another view, Fig. 2, shows the concrete buttresses and piers for the steel structure over Center Creek. It may be noted that the poles are not supported by the steel structure, but are set in the ground in the usual manner, extra long ones being employed. Both views show the rip-rap work which protects the foot of the embankment on either side. East of Oronogo the line passes above the tracks of the Frisco System on a 600-ft. viaduct. Beyond this point a bridge one-half mile in length carries the tracks over Spring River. The river rises far out of its banks at times, and in order to get above high-water mark the bridge was built high and very heavy grading was consequently necessary for the approaches to it. When the line is completed a half-hour schedule will be inaugurated. The cars for service on it are now being constructed in the shops of the company at Webb City.

THE NEW CARS

The cars which have been adopted as the standard for the system were designed by E. J. Pratt, mechanical and electrical engineer of the system, and are being built under his direction. The car itself and several features of its construction are well shown in the accompanying illustrations. It is somewhat peculiar in design in that four steel I-beams

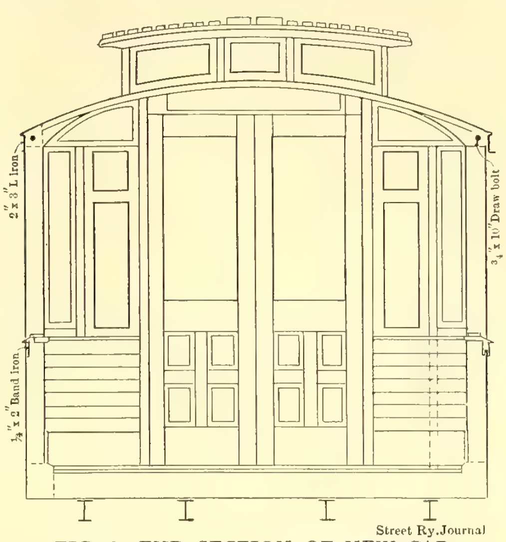
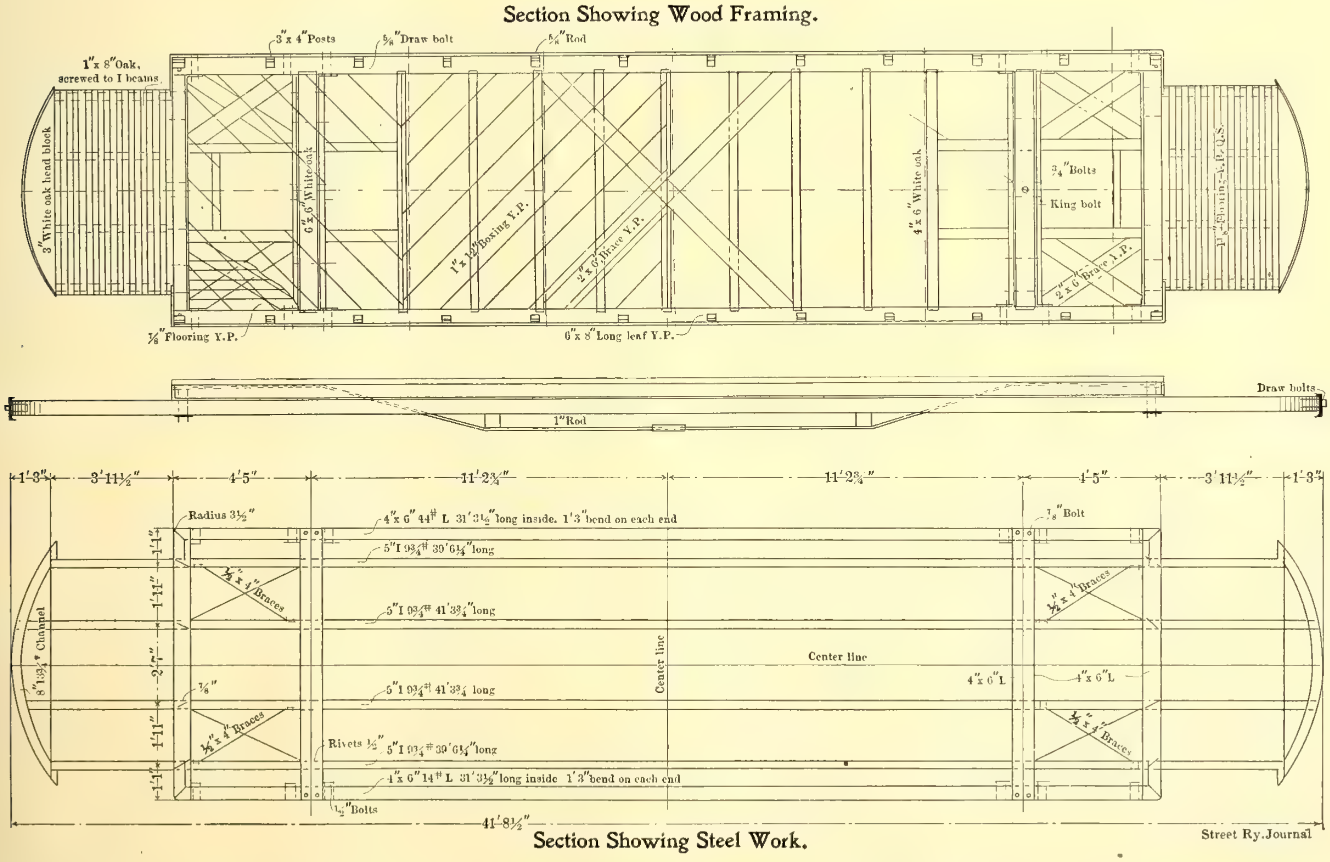


FIG. 6.—END SECTION OF NEW CAR

extend the full length of the car, from bumper to bumper, and the body of the car proper rests on these beams. In the design of the car every little detail was given attention. The



FIGS. 4 AND 5.—SHOWING WOODEN AND STEEL FRAMING OF CARS BUILT BY THE SOUTHWEST MISSOURI ELECTRIC RAILWAY

timber was personally selected by Mr. Pratt in southern yards and some of it has been on hand for five years. Each car measures 42 ft. over all in length and is 8 ft. 7 ins. wide over the sills. The four I-beams are riveted together by two 4-in. x 6-in. angle bars over each bumper. These bars, which are placed with the shorter flanges down against the I-beams and a few inches apart, form a pocket which is filled with three pieces of oak, between which are sandwiched steel plates

⅝ in. x 4½ ins. placed vertical. At their outer ends these angle bars furnish support to the 4-in. x 6-in. angle bars forming the outside of the side sills. These latter angles at their ends are bent at right angles and are riveted to the outer of the four I-beams, running the full length of the car, and to the 4-in. x 6-in. angles forming the end sill. A chan-

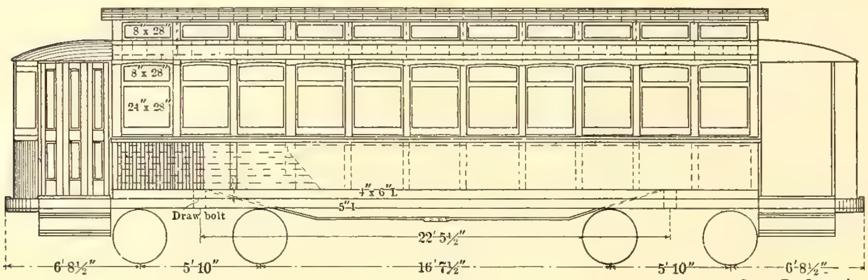


FIG. 7.—SIDE ELEVATION OF NEW CAR

nel bar forming the bumper iron is placed over the ends of the I-beams and is riveted to each of the beams by angle plates. To strengthen the channel bar at the extreme point where it would receive heavy blows in case of collision with another car, a 1-in. x 4-in. bar placed immediately behind the channel extends between the two center I-beams. The I-beams consequently are riveted together by cross bars at six separate places, at the bumpers, at the end sills, and at the bolsters, as shown in Fig. 5. All of the riveting is done hot in the shop by means of a portable forge.

The side angles are filled in with 6-in. x 8-in. yellow pine sills, while the end angles are similarly filled with beams to from the end sills. Cross sills of 4-in. x 6-in. oak, Fig. 4, extend at intervals of about 24 ins. between the two side sills. A ⅝-in. tie rod is placed alongside each alternate cross sill and terminates in bolts on the outside of the side angles. Cross braces of yellow pine at the center and at the ends of the car give additional strength to the framing.

The floor is double, and consists of a lower one of 1-in. x 12-in. yellow pine laid diagonally, and above this another of ½-in. yellow pine flooring laid lengthwise. Between the two

FIG. 8.—INTERIOR OF CAR UNDER CONSTRUCTION, SHOWING INSIDE TRUSSES

floors is a layer of asbestos. The platform floor is laid crosswise, and each piece is screwed to each I-beam by screws passing through drilled holes in the webs of the beams. The 3-in. white oak head block, shown in Fig. 6, is also secured to the I-beams just behind the channel bar, forming the bumper. Each of the side posts is secured to the side sill and to the plate by a draw bolt extending through the sill and nutted on the opposite side. The belt rail under the windows is securely mortised into the posts and the furring below this is wedged down tightly by wedges under the belt rail at each post. Additional bracing of the body is obtained by the inside iron truss, which may be observed in Fig. 8.

The outside sheathing below the belt rail is glued in the usual manner, and in addition a ¼-in x 2-in. iron band is screwed just under the belt rail over the ends of the sheathing, while a half oval strip protects the bottom edges. The eave rail is of 2-in. x 3-in. angle iron.

The roof is of the canopy type. A feature out of the ordinary is that a roof mat extends over the whole of the upper deck. This mat was so placed as to protect the roof from blows from the trolley and from the shoes of the trainmen. The interior of the car is divided by a glass partition into a smoking and main passenger compartment. The finish in imitation of antique oak not only gives a very attractive appearance to the interior, but it does not show dirt as readily as a lighter finish. An objection to it, however, is that the lighting is not as effective as it would be with a lighter finish.

The car is heated by electric heaters placed under the seats.

FIG. 9.—END OF CAR, SHOWING I-BEAMS, UPON WHICH THE PLATFORM AND VESTIBULE ARE BUILT

Heat is required during a comparatively short period of the year in this climate, and this makes electric heating preferable to the employment of a hot-water system.

The car is mounted on Taylor trucks, and the fact that there are no dropping platform timbers permitted the trucks to be placed as near the end of the car as the clearance of the steps would allow. They are placed with their centers 22 ft. 5½ ins. apart. Four G. E.-70 motors are mounted on

the trucks and General Electric type-M control, equipped for double end operation, is employed. Although multiple-unit operation is not being carried out at the present time, provision is being made for this in the future by placing control cable receptacles on the cars. The chief reason for the installation of the type-M system was the elimination of the heavy maintenance expenses of the direct controller and the avoidance of flashing and burning on the front platform.

CAR LIGHTNING PROTECTION

The repairs to direct controllers have been excessive, due largely to the burn-outs from lightning, which is usually severe in this region. Lightning storms are not only of frequent occurrence but the discharges seem to consist of a greater volume of current than is usually encountered. Special means have been provided on the new cars to prevent lightning entering the car. A choke coil of forty-six turns is placed in the main circuit and four arresters are used in connection with it. Two of them placed in multiple are connected on the trolley side of the choke coil, while two additional ones similarly connected are tapped in on the choke coil at about its middle point. To avoid damage to armatures should the discharge enter the motors, the fields are connected in the circuit first, which, of course, necessitates changing the direction of the current in the fields when the car is reversed. The fact that the fields can be better insulated and that if they become grounded less expense is entailed than when the armature is grounded were the chief reasons for so connecting the motors. In addition to the choke coil in the main circuit another is placed in the lighting and control circuit. Additional precaution is taken by instructing the conductor to keep the lights burning through thunder storms, and to pull the trolley down if a stop of any length is made during a storm.

FIG. 10.—INTERIOR OF COMPLETED CAR

THE DESPATCHING SYSTEM

The interior of the despatcher's office, which is located over the veranda of the office building at Webb City, is shown in Fig. 12. The board is laid off with sidings and branch lines to correspond with those on the tracks of the system. Holes are drilled in at frequent intervals for the insertion of plugs bearing car numbers. Plugs for trains going west are inserted in the top holes, while those headed in the opposite direction are placed in the lower line of holes. When an order is given to a car the plug for that car is advanced to the hole corresponding to the next reporting and passing point. However, if a passing order is given a plug of different appearance is inserted in the hole corresponding to the passing point, while the plug bearing the car number is advanced to the next point from which the car will be reported. Orders are received by the conductors, and must be obtained at each meeting point unless special orders to the contrary have been obtained.

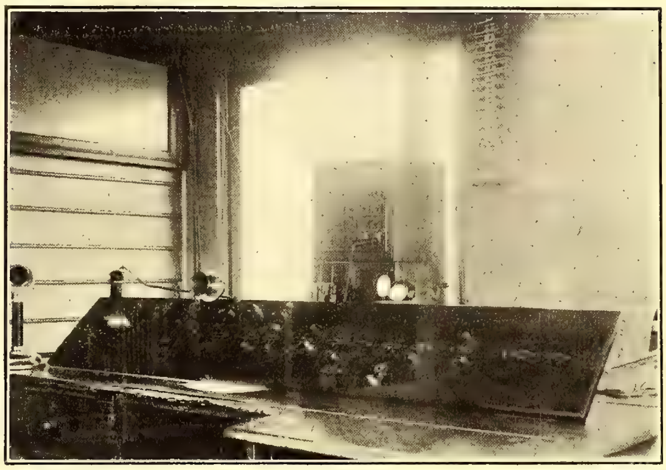


FIG. 12.—INTERIOR OF THE DESPATCHER'S OFFICE AT WEBB CITY

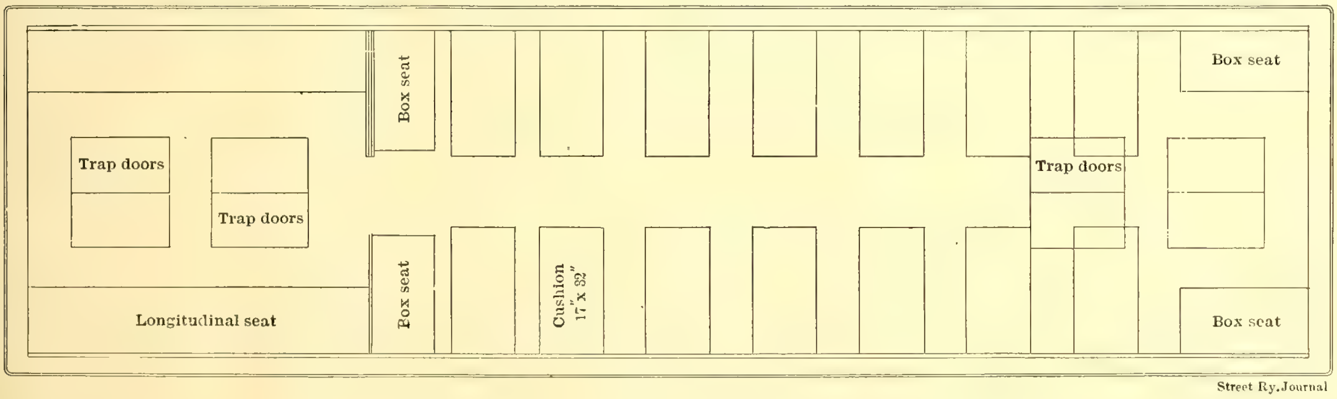


FIG. 11.—ARRANGEMENT OF SEATS AND LOCATION OF TRAP DOORS

EMPLOYEES' CLUB

Practically all of the employees belong to the Electric Railway Club, which has quarters near the office. One room is fitted up as a library, while the other, Fig. 13, contains billiard and pool tables. A fee of 50 cents per month is charged, and a sick benefit is allowed members when ill. The badge of the association is in the form of a botton which, when worn, serves as a pass over the line at any time.

TREATMENT OF EMPLOYEES

The company treats its men with consideration and respect

and as a result has been able to obtain a better class of men than is often found on railway systems. In all there are about 70 trainmen, the greater number of whom have been in the employ of the company for years. Every encouragement is given the employee to remain with the company. The fact that practically all of the officers of the road have been promoted to their present positions from that of motorman or conductor offers considerable encouragement to the employee to remain with the company. He is made to feel that if he proves capable other positions better than his present one are open to him. The company is rather lenient with regard to permitting free travel of its employees over the road. As previously mentioned, the badge of the Electric Railway Club serves as a pass at any time, whether or not the employee is in uniform. The families of employees are given a reduced rate.

In hiring new men usually only those living in the vicinity and whose habits and character are known are considered.

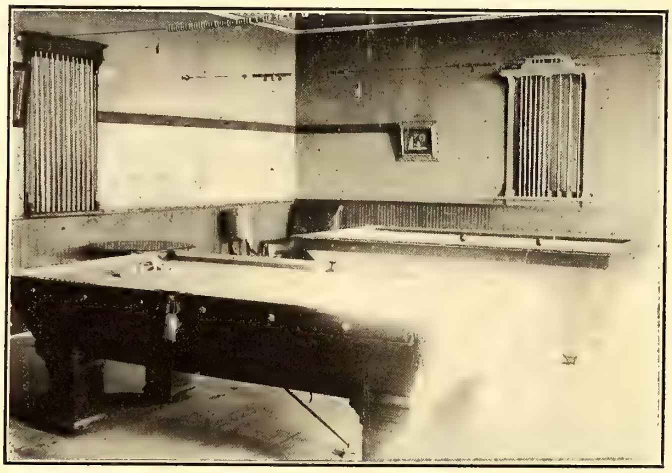


FIG. 13.—BILLIARD AND POOL TABLES IN THE CLUBROOMS

There is, however, very little occasion for the employment of new men, as it is very seldom that an employee leaves the company of his own accord.

The moral tone of the trainmen is kept at a high standard by the strict demands of the company, together with the system of inspection maintained to see that all rules are observed. The rules, a copy of which is furnished to every trainman, state that an employee must not smoke or use intoxicating liquors while on duty, and must not get under the influence of intoxicating liquors or enter gambling resorts at any time. To see that these rules and others relating to conduct are observed a secret inspector who frequents saloons and places of ill-repute is employed. Another inspector, known to the men, reports any violations observed, but his duty is to report particularly on violations of rules governing car service.

THE MERIT SYSTEM

Employees are disciplined by means of a merit system, which is in charge of S. W. Gunsalus, superintendent of transportation. An accumulation of 100 demerits is sufficient to cause a man's discharge. For many commendatory acts merits are allowed, and these counterbalance or cancel demerits already obtained. All merits and demerits are cleared off of an employee's record every six months. The accompanying lists show the violations for which demerits are given, as well as those actions for which merits are allowed. Both conductors and motormen are subjected to immediate discharge for disloyalty to the company, intoxication, gambling and similar offenses. The conductor is also subjected to demerits for offenses, such as failure to turn in reports, not keeping his car clean, sitting down in the car and failure to report delays. Merits on the other hand are given for neatness in personal appearance, politeness and attention to passengers, for turning in complete reports of accidents and for display of good judgment in emergencies. Offenses for which the motorman receives demerits are largely those relating to the abuse of the car apparatus. Demerits are also given for untidy appearance, not obeying the conductor, not repeating orders to the despatcher, and like offenses. Good reports from car house men regarding the care of the equipment, economy in the use of power and making repairs on the car that avoided its being sent into the shop, and such other commendatory acts are rewarded with merits.

Southwest Missouri Electric Railway Company.

Webb City, Mo.,..........................1906

MERIT MARKS.

Mr ....

....

You have today been given.................Merit Marks on Charge

No ...., contained in the merit system of discipline.

Date..........................

Time.......................... S. W. GUNSALUS,

Place.......................... Superintendent.

FIG. 14.—RECORD OF MERIT MARKS

Southwest Missouri Electric Railway Co.

WEBB CITY, MO.,——————1905.

NOTICE TO TRAINMEN.

A.......... on ——————line has this day been given ——————

——Marks on Charge No.—————in the Merit System of Discipline.

S. W. GUNSALUS. SUPT.

By——————

FIG. 15.—NOTICE TO TRAINMEN IN REFERENCE TO MERIT MARKS

Its sheets specifying those violations for which demerits are given, as well as those commendatory actions for which merits are allowed, are posted on a bulletin board in the club room. The inspectors turn in reports of merits and demerits to the office of the superintendent of transportation. He in turn notifies the trainmen on a blank used, Fig. 14, especially for the purpose, that a certain number of merits or demerits have been given him for a specified cause. A notice, Fig. 15, is also publicly posted in the club room to the effect that a motorman or conductor, as the case may be, has been given demerits or merits for a specified violation or commendary action. This public notice, however, does not specify the name of the motorman or conductor, but states simply that "a" motorman has received demerits. A list of merit and demerit values is present herewith:

DISCIPLINE OF EMPLOYEES BY THE MERIT SYSTEM.

IMMEDIATE DISCHARGE

1. Disobedience of rules governing railroad crossings.
2. Disloyalty to company.
3. False statements.
4. Intoxication.
5. Dishonesty.
6. Gross ungentlemanly conduct.
7. Gambling.

CONDUCTOR'S DEMERITS

8. Failure to report accidents	10—100
9. Giving bells too quickly, and when not in proper position	5
10. Smoking on duty	20— 50
11. Error on trip sheet	2— 5

12. Short or long on Ohmer register, .25-1D, .50-2D, .75-3D, 1.00	5
13. Failing to turn in daily receipts before 11 a. m.	5
14. Failure to cancel coupons when collecting same	5
15. Failure to sign and date semi-monthly report	5
16. For neglecting to punch half fares before issuing	5
17. Neglecting to enclose ticket with conductor's name in turn-in	5
18. Neglecting to turn in semi-monthly report by 11 a. m., the third and eighteenth of each month	5
19. Error punching transfers	2
20. Deliberately punching transfers to permit lay-over	20
21. Register not turned at end of line when required	10
22. Bunching fares	5
23. Missing fares	2— 10
24. Incomplete and poor accident reports	3— 10
25. Inattention to passengers	2— 10
26. Trouble with passenger when conductor is to blame	10
27. Missing or losing out	10
28. Dirty car	5
29. Untidy condition of dress	2— 10
30. Tail light not burning after dark	5
31. Reading on duty	10
32. Sitting down in car when running, except when eating meals	5
33. Unnecessary talking to motormen, passengers or employees	5— 10
34. Drinking or frequenting saloons at any time without good excuse	10— 50
35. Letting boys change trolley	5
36. Failure to announce streets	2— 5
37. Profanity in the presence of passengers	5— 25
38. Disobedience of orders whether verbal or by bulletin; if flagrant, discharge	10—100
39. Running away from passengers	10
40. Bad judgment or carelessness in regulating heat on car	5
41. Bad judgment on special occasions	2— 10
42. Criticising management of road in presence of passengers	5
43. Careless and indifferent operating of car	5— 10
44. Impolite remarks to passengers	5— 25
45. Garnishee of wages	5
46. Failure to report register when out of order	5
47. Not going ahead and reporting in cases of breakdown or accident	5
48. Failure to report delays	2— 10
49. Acts detrimental to good service in opinion of superintendent	3— 20
50. Not having rear destination sign properly displayed	5
51. Carrying passengers by their destination when notified beforehand	5
52. Lamp globes not cleaned	5
53. Reporting for duty without regulation uniform, except new men	5
54. Running beyond orders given by despatcher, foot extra list or	100
55. Failure to be supplied with half fares and use same properly	5
56. Failure to observe danger or precautionary signal	5— 50
57. Negligence in not closing and locking switch properly	2—100
58. Backing car without taking proper precautions	5
59. Collecting fares on railroad crossings	10
60. Error or misstatement of amount of cash in turn-in	3— 5
61. Recommending unworthy men for employment	5
62. Accident when avoidable in opinion of superintendent	10—100
63. Neglecting to get supplies at office	3
64. Talking about accidents to others than proper officials	20
65. Not in proper place on car	
66. Carrying ex-employees or other passengers free	5
67. Failure to account properly for all freight handled	10
68. For not giving proper attention to packages or freight handled on car	5
69. For refusing to give freight receipts	5
70. Running ahead of schedule time	5— 15
71. Loud and boisterous talking to fellow employees or passengers on passing cars	3— 10
72. Failure of extra car or local to flag Twentieth Street curve when signals are out of order, and main line cars when off time	25
73. Drinking on duty	100
74. For acting as motorman unless absolutely necessary	5— 20
75. For allowing motormen or others to collect fares	5— 50
76. For not giving orders to motorman before boarding car	5
77. Failure to keep left hand gate closed	5
78. Failure to keep doors closed in cold weather	5
79. For making overcharge on freight	5
80. For violation of any part of any rule not above designated according to opinion of superintendent	1—100

CONDUCTOR'S MERITS

1. Warning persons when in the act of jumping, to to wait until the car stops	5— 20
2. Securing names and addresses of witnesses who saw accident, other than those on report, each	5
3. Politeness and attention to passengers	5
4. Assistance rendered in case of accident, such as to bring commendation from passengers	10— 50
5. Adjusting window and shades to please passengers	5
6. Informing company of matters in interest of good service	5— 20
7. Reports as to defects in equipment while operating car	1— 5
8. Complete and perfect accident reports	5
9. Good judgment and work in handling layout and blockade	5— 20
10. Special meritorious acts calling for recognition from the company	5— 50
11. Turning in fare books or badges ordered up by the company	5
12. Exact account in daily turn-in on Ohmer register	7
13. Accuracy in daily turn-in on Meaker register	2
14. Notable economy in use of heaters	5
15. Striving to keep car neat and clean, lamps, etc.	5
16. Neatness of semi-monthly report and trip sheets	5
17. Promptly turning in all articles found in car	2
18. Neatness in personal appearance	5— 20
19. For driving stock out of right of way	20
20. For sanding Fourth Street curve when rails are slippery	5
21. For keeping tail light in good condition	5
22. For reporting cattle in the right of way	5

SOUTHWEST MISSOURI ELECTRIC RAILWAY COMPANY

Discipline of employees by the merit system in effect Oct. 1, 1905.

IMMEDIATE DISCHARGE

1. Disobedience of rules governing railraod crossings.
2. Disloyalty to company.
3. False statements.
4. Intoxication.
5. Dishonesty.
6. Gross ungentlemanly conduct.
7. Gambling.

MOTORMAN'S DEMERITS

8. Failure to make safety stop at railroad crossings	25—100
9. Failure to bring car to standstill at Joplin Street on the Chitwood and Smelterhill lines, or Fourth or Second on Main	25
10. Headlight not burning after dark without good cause	10
11. Feeding current too fast	5
12. Not properly slowing down and ringing gong when passing another car on double-track or switch	5
13. Not taking proper care of controllers	10
14. Not properly oiling trolley and wheel or motor bearings	10
15. Not cleaning commutators and brushes	10
16. Running circuit breakers without throwing off current	10
17. Stopping car or running down grade with current on	10
18. Injury to car equipment caused by improper handling	10— 50
19. Careless and indifferent operating of car	2— 20
20. Reckless running	25
21. Reversing car when under headway, except to avoid accidents	10
22. Failure to see that sand-boxes are filled	5
23. Not having proper tools	5
24. Failure to report accidents	10—100

25. Missing or losing out 10
26. Smoking on duty .... 20—50
27. Untidy condition of dress .... 2—10
28. Allowing unauthorized persons on the front platform 10
29. Disobedience of orders, verbal or by bulletin (if flagrant, discharge) .... 10—100
30. Drinking or frequenting saloons at any time without good cause .... 10—50
31. Profanity in presence of passengers .... 5—25
32. Accidents when avoidable in opinion of superintendent .... 10—100
33. Unnecessary conversation with passengers or employees while operating car .... 5—25
34. Failure to report trouble or known defects with car. 5—25
35. Not answering signals promptly 2
36. Running away from or passing up passengers 10
37. Starting car without proper signal except to avoid accident 20
38. Following car in front too close .... 10—100
39. Running too close to vehicles or pedestrians upon track before getting car completely under control 10
40. Bad judgment on special occasions .... 1—10
41. Leaving car without taking reverse lever 10
42. Leaving car when conductor is absent 10
43. Not obeying conductor's signal 5
44. Not looking back when conductor is flagging 10
45. Trouble with passengers when motorman is to blame 10
46. Garnishee of wages 5
47. Not having front destination sign properly displayed 5
48. Talking to others than proper officials of company about accident 20
49. Criticising management of road in presence of passengers 5
50. Failure to report delays 2
51. Reporting for duty without regulation uniform, new men excepted 5
52. Running into open switch .... 2—20
53. Failure to see that switch is properly set after passing over same .... 10—100
54. Failure to observe and obey danger or precautionary signals of any kind whatever .... 10—100
55. Backing car without taking proper precaution 20
56. Running beyond orders given by despatcher, foot of extra list or 100
57. Failure of extra or local cars to flag Twentieth Street curve when the signals are out of order, and main line cars when off time 25
58. Running ahead of schedule time .... 5—15
59. Drinking intoxicating liquor on duty 100
60. For starting car on one bell .... 5—20
61. Flattening wheels when avoidable .... 1—20
62. Acts detrimental to good service in opinion of superintendent .... 3—20
63. Running into switches too fast 10
64. Running over switches too fast 10
65. Running out of switches too fast 10
66. For loud and boisterous talking to fellow employees or passengers on passing cars .... 3—10
67. For starting car before the incoming car has entered switch and is in the clear 10
68. For sitting down at places otherwise than those designated 25
69. For allowing anyone except superintendent, inspector, or the regular conductor to operate car.. 5—50
70. For allowing conductor to operate car unless it is absolutely necessary .... 5—20
71. Failure to stop front end of car at telephone when practicable 5
72. For not paying attention and repeating orders to conductor 5
73. Failure to have both front gates closed when car is moving. Main line or local 5
74. Failure to keep front doors closed in cold weather.. 5
75. For collecting freight money 5
76. Applying air too severely .... 5—20
77. Recommending unworthy men for employment 5
78. For not giving proper attention to packages or freight handled 5
79. For violation of any part of any rule not designated above, according to opinion of superintendent .... 1—100

MOTORMAN'S MERITS

1. Warning persons in act of jumping on or off car to wait until the car stops .... 5—20
2. Securing names and addresses of witnesses who saw any accident other than those on report 5
3. Politeness and attention to passengers 5
4. Assistance rendered in case of accident, such as to bring commendation from passengers .... 10—50
5. Informing company of matters in interest of good service .... 5—20
6. Complete and perfect accident report 5
7. Good judgment or work in handling layout or blockade .... 5—20
8. Good stop to avoid accident .... 5—50
9. Special meritorious acts calling for recognition from company .... 5—50
10. Promptly reporting any defects .... 3—10
11. Careful handling of car 5
12. Good reports from house men or inspector as to the care of motors, bearings, controllers, etc .... 5—20
13. Notable economy in the use of power .... 5—25
14. For tying up hangers, fixing 'phones, etc., while on duty 5
15. For making repairs on car that will prevent it from having to be turned in to house .... 5—25
16. Neatness in personal appearance .... 5—20
17. For cleaning track and switches, closing right of way gates, etc. .... 3—10
18. For driving stock out of right of way 20
19. For sanding Fourth Street curve when rails are in slippery condition 5
20. For cleaning vestibule windows 5
21. For keeping headlight in good shape 5
22. For reporting cattle in the right of way 5

CARE OF EQUIPMENT BY MOTORMEN

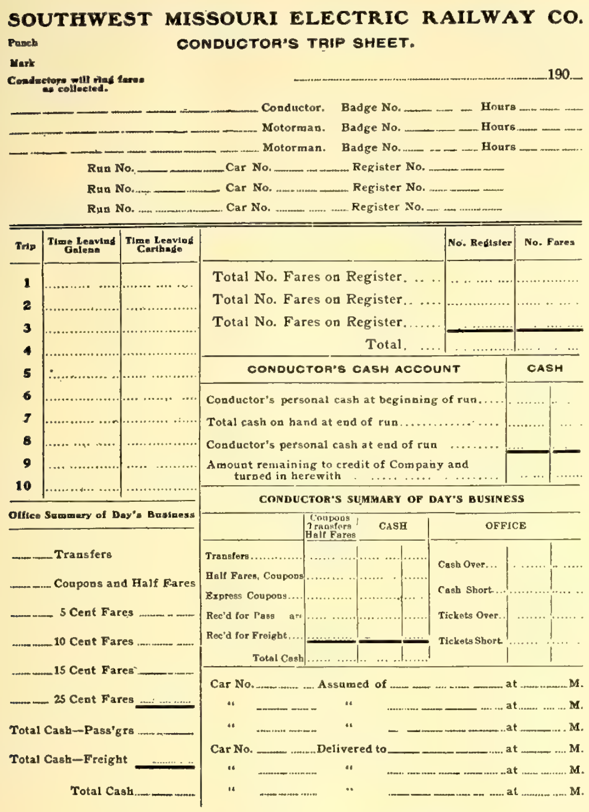
It was stated that demerits were given the motorman for inattention to the electrical apparatus. The motormen are, in fact, entirely responsible for the care of all the apparatus of the car, including the oiling of the bearings. They carry a wrench, pliers, sand paper, carbon brushes and other tools and material necessary to clean and make slight repairs. On the Galena-Carthage run, a lay-over of one-half hour is allowed in Carthage especially for the purpose of giving the trainmen time to go over the cars. These lay-overs come after a continuous run of three and one-half hours, and during each of them the motorman must oil his trolley wheel and inspect all bearings. The whole half hour, in fact, is spent in cleaning the controller and examining the motor bearings, motors and other parts. The rules state that commutators are to be cleaned with canvas three times a day, and the brushes are to be inspected once each day. In short, the motorman is required to take care of all the apparatus of the car. All repair work and adjustment of brakes, however, is done in the shop. Conductors on the other hand are required to spend the half-hour lay-over in a general sweeping and cleaning of their cars, they being entirely responsible for the condition of the cars.

CONDUCTOR'S REPORTS

At the end of each day the conductor is required to fill out and turn in the trip sheet shown in Fig. 16. Blank spaces on it make provision for changes of motormen and of cars. The conductor makes a summary of the day's business, indicating the number of transfers, half fares and others received, and after the register readings have been obtained the office also makes a summary, and the amount of cash or tickets over or short is recorded on the sheet. Demerits are given if the register indicates the conductor either short or long. The number of demerits vary from one for a mistake of 25 cents to five for a mistake of one dollar.

In addition to the daily trip sheets, conductors turn in semi-monthly reports, two of which are reproduced in Figs. 17 and 18. These reports are simply to check the receipts of similar runs for the same length of time. The receipts turned

in by conductors on similar runs may vary from day to day, but it has been found that during a period of one-half month the total receipts from similar runs average about the same per hour. The two cards show how closely these receipts


SOUTHWEST MISSOURI ELECTRIC RAILWAY CO.
Punch Mark
CONDUCTOR'S TRIP SHEET.
Conductors will ring fares as collected.
190
Conductor. Badge No. Hours
Motorman. Badge No. Hours
Motorman. Badge No. Hours
Run No. Car No. Register No.
Run No. Car No. Register No.
Run No. Car No. Register No.

Trip	Time Leaving Galena	Time Leaving Carthage		No. Register	No. Fares
1			Total No. Fares on Register		
2			Total No. Fares on Register		
3			Total No. Fares on Register		
4			Total		
5			CONDUCTOR'S CASH ACCOUNT	CASH	
6			Conductor's personal cash at beginning of run		
7			Total cash on hand at end of run		
8			Conductor's personal cash at end of run		
9			Amount remaining to credit of Company and turned in herewith		
10					

Office Summary of Day's Business
Transfers
Coupons and Half Fares
5 Cent Fares
10 Cent Fares
15 Cent Fares
25 Cent Fares
Total Cash—Pass'grs
Total Cash—Freight
Total Cash

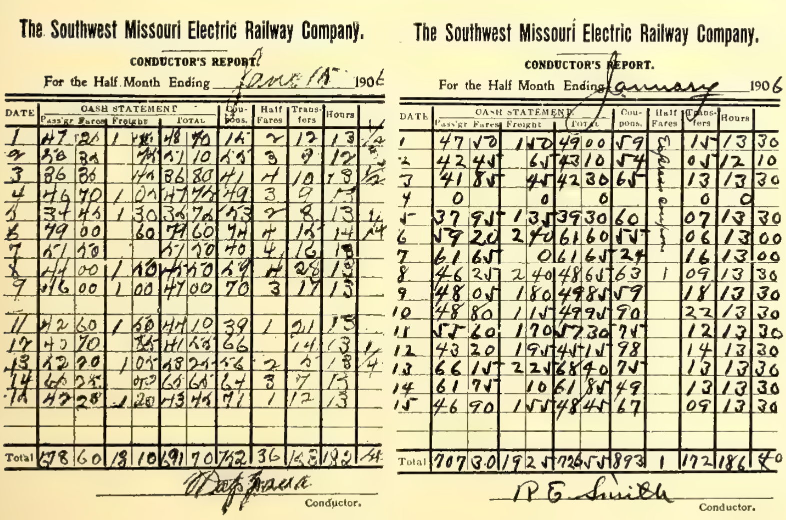
CONDUCTOR'S SUMMARY OF DAY'S BUSINESS

	Coupons Transfers Half Fares	CASH	OFFICE	
Transfers			Cash Over	
Half Fares, Coupons			Cash Short	
Express Coupons			Tickets Over	
Rec'd for Pass ar			Tickets Short	
Rec'd for Freight				
Total Cash				

Car No. Assumed of at M.
" " at M.
" " at M.
Car No. Delivered to at M.
" " at M.
" " at M.

FIG. 16.—CONDUCTOR' TRIP SHEET

coincide. The conductors make out the report for each day before turning in the trip sheet. At the end of the half month they turn in the report with all the figures totaled. The office force checks the figures with those on the trip sheets and then reduces the receipts to a basis of receipts per hour by dividing


The Southwest Missouri Electric Railway Company.
CONDUCTOR'S REPORT.
For the Half Month Ending June 15 1906
DATE | CASH STATEMENT: Pass'gr Fares, Freight, Total | Coupons | Half Fares | Transfers | Hours
Total
Conductor.

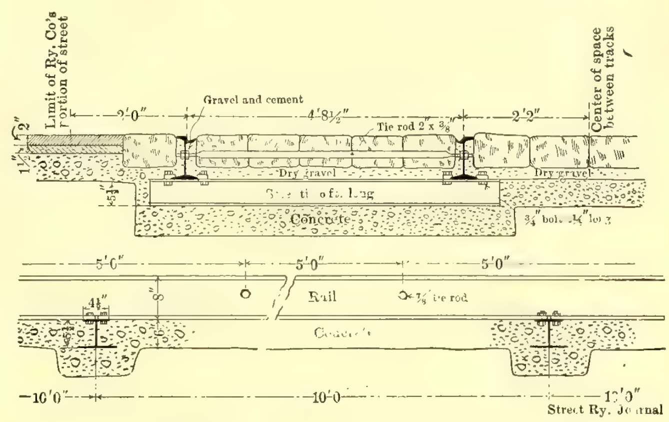
The Southwest Missouri Electric Railway Company.
CONDUCTOR'S REPORT.
For the Half Month Ending January 1906
DATE | CASH STATEMENT: Pass'gr Fares, Freight, Total | Coupons | Half Fares | Transfers | Hours
Total
R. E. Smith
Conductor.

FIGS. 17 AND 18.—CONDUCTORS' SEMI-MONTHLY REPORTS, WHICH SERVE TO CHECK RECEIPTS

by the total hours the car was in operation. The two cards shown were for the afternoon and night run on the main line. It may be noted that, while there is a wide difference between the daily receipts from the two cars, in one instance the receipts from passengers were $79 on one car and $59.20 on the other, for the whole period the receipts per hour differ for the two runs by an amount less than 1-3 of 1 per cent. The results on the cards shown, however, are somewhat closer than usually obtained, as the average variation is about 1 per cent to 2 per cent. The office force in checking and comparing the receipts from similar runs throughout the day soon become trained, so that any variation from the usual receipts or variation between cards of similar runs becomes apparent at once. Such variations serve simply as a guide for making investigations.

NEW TRACK CONSTRUCTION IN BUFFALO USING STEEL TIES AND CONCRETE FOUNDATION

The International Railway Company, of Buffalo, N. Y., has decided to lay 5½ miles of double-track steel and concrete roadbed in the manner illustrated in the accompanying sections on its Fillmore Avenue line, which carries considerable heavy traffic through the east side of the city. The



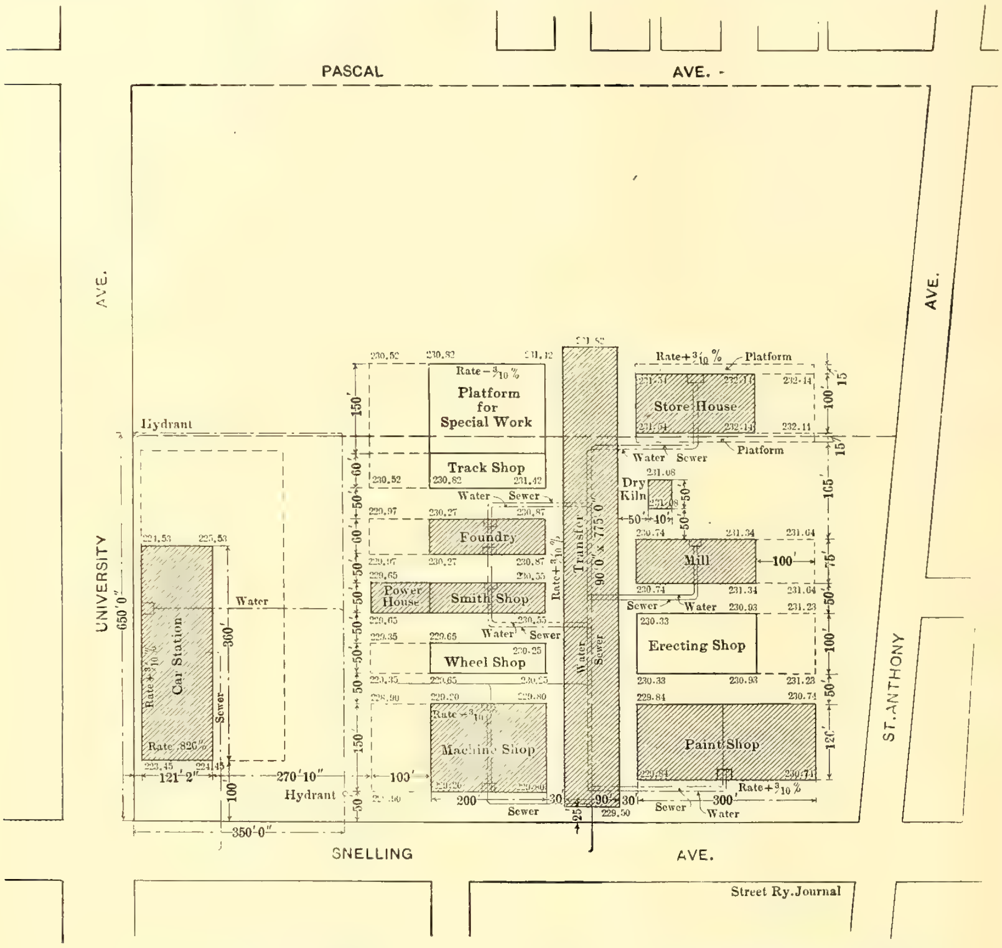
CROSS-SECTION OF STEEL AND CONCRETE ROADBED FOR FILLMORE AVENUE LINE, BUFFALO

new construction replaces wood ties, and involves the use of steel ties embedded in concrete. The ties are double channels, 6 ft. long, 4½ ins. wide at the top and 8 ins. at the base. They are spaced 10-ft. centers, as against 5-ft. centers with wood ties. It is expected that they will last at least three times as long as the latter, or about twenty years. The tee rods are spaced 5 ft. centers. The other construction details can be readily seen by reference to the illustrations.

The famous sink hole on the line of the Urbana, Bellefontain & Northern Railway, which attracted the attention of engineers at the time the road was built two years ago, and for many months balked the construction force that then was building the road, is again giving trouble. This week the company's track and an expanse 50 ft. wide and 150 ft. long, including the country road, sank out of sight and there is now a lake of water 14 ft. deep in the place. The road was tied up until the company could build a temporary track around the newly developed lake. The construction company which built the road dumped more than 2000 carloads of gravel, brush and timbers into this hole, and for more than a year it has given trouble. The ground at this point is of a peat-like substance. Fifty years ago, when the Big Four Railroad was built through this district, a similar experience was had. The timber from 20 acres of land was driven in the form of piling to form a foundation. Finally a high bank was built across the treacherous ground and the steam road has since had no trouble. The electric line will probably have to do something of this kind also.

THE NEW SHOPS OF THE TWIN CITY RAPID TRANSIT COMPANY

The Twin City Rapid Transit Company, of Minneapolis and St. Paul, has begun the erection of new shops for the maintenance of all the equipment operated in the two cities and on the surrounding interurban lines. Construction work is already well under way. The car station is almost completed, and the foundations for practically all of the buildings are in place. It is expected that they will be ready for occupancy in the fall. The shops are being built on a site about midway between the two cities and cornering on University and Snelling Avenues. The buildings are to be of concrete steel construction. The walls will be faced with cement brick, backed by cement blocks. The blocks and brick are being manufactured by the company on the site of the shops.



LAYOUT OF PROPOSED SHOPS FOR THE TWIN CITY RAPID TRANSIT COMPANY

The accompanying drawing shows the relative arrangement of the buildings. Those cross hatched are to be erected at once. The machine shop, foundry and mill will be built with a view to enlarging them at some future time by extending them 100 ft., as shown by the dashed lines. As a precaution against the spreading of fire, a 50-ft. space is allowed between the separate buildings, and the car station will be provided with automatic sprinklers.

The machine shop will be built with a central bay and wings on either side. Four tracks will run through the center and will be served by two 25-ton cranes spanning the central bay. Galleries will be built in the wings. The lighter machine tools will be installed in these, while the heavier machinery will be located on the main floor underneath, which will be of wood laid on concrete. A wheel shop will eventually be built adjacent to the machine shop. For the present, however, the wheel work will be done in the machine shop. The paint shop will be provided with cranes, and a fireproof room will be built for the storage of paints.

Power for the shops will be supplied at 220 volts from the Snelling Avenue sub-station, located in the front portion of the car station. This sub-station is one of the several supplying current for operating the cars, but a motor-generator set will be installed to care for the shop load. About 300 hp of motors will be employed. The shops will be lighted by both incandescent and multiple-arc lights. All the buildings will be heated by steam from a central plant in the rear of the smith shop.

The dry kiln will be heated by hot air, obtained by means of fans which will drive air over steam pipes. Water will be secured from the city mains. A sewage system connected to all the buildings will empty into the city sewer on Snelling Avenue. All of the buildings will be supplied with ample toilet facilities. The shops are being built for a capacity of about 50 per cent greater than the present shops at Blaisdell Avenue and Thirty-first Street, Minneapolis. However, a 20-acre tract, belonging to the company, east of the site now being covered with buildings, will permit future extensions should these be needed at any time. The construction work is under the supervision of C. F. Ferrin, superintendent of buildings for the company.

TOLEDO & WESTERN DENIED ADMISSION TO CENTRAL FREIGHT ASSOCIATION

At a meeting of the Central Freight Association held a few days ago, a request made by the Toledo & Western Railway Company for admission to the association on the ground that it is a common carrier was denied. As is generally known, this road handles standard freight trains with electric locomotives, and pro-rates business with connecting lines. In spite of the refusal, the Wabash Railroad and the Detroit, Toledo & Ironton announced that they would take independent action and recognize the Toledo & Western as a common carrier and exchange business with it. There is a growing sentiment in favor of such alliances on the part of the steam roads, and it is generally predicted in steam-road circles that within another year this and possibly other freight roads will receive recognition from the Central Freight Association.

The report of the United Railways Company, of St. Louis, for three months ending June 30 shows that 47,206,590 passengers were carried on 1,278,252 trips. During the corresponding period of last year the same company made 1,286,088 trips and carried 44,325,352 passengers.

THE CORPORATION AND THE PUBLIC

BY EDWARD P. HULSE

The present seems to be the day of publicity concerning the inner workings of all great businesses. What the cause may be need not be discussed here, but the public is certainly abroad with the interrogation point, and those corporations whose business is large enough to be classed as of a semi-public nature are the ones most likely to feel the effect. Nothing seems now too severe to be asserted against a corporation and those connected personally with its management by the yellow press—and believed by the public. How can this sentiment be overcome by the railway companies? Can it be negatived?

There is a remedy—a remedy in the experience of those who have tried it that is easy; and the conservatism of large operations need not be compromised thereby. This is a plea for that method; and specific instances will be cited. Street railway lines pay dearly for not letting the traveling public know more about the business where it touches them and the reasons back of all "rules and regulations"—pay for it in good dollars in a business where the unit is a nickel. I did not use the trite phrase "take the public into their confidence," for that is not what I mean. I do not believe in too much of the "open-mouth" policy; but I have found that it pays to transmit such an understanding of street railway operation where it meets the public, and of the principles back of it, as any business house is glad and willing to give its customers. I said "pays" with full knowledge of the weight of the word. I am in similar case with the man who said that he knew honesty was the best policy for he had tried both ways. All street railway men know how unfriendliness on the part of the public has a direct effect on the tangible property of a street railway company. Plush seats are cut open, rattan seats are split with a knife, heels ground into fine finish, curtains ripped out, sash springs broken, the least want of repair or the hard working of a door is enough to warrant the public in smashing it. These repairs count up. The uniformed employees of some roads are treated by the public so unfairly, even contemptuously, that it is difficult for these roads to get good men, and in some cities the companies have to accept foreigners who can hardly speak the language. Then from the traffic agent's point of view friendliness is the greatest asset, and he spends the money appropriated to Account 31 in cultivating it, for he knows that "good will is gain." Street railway managers in particular become calloused to what the public thinks of the lines. As I said in a previous article* touching this one point: "Road managers become so interested in the details of operation that they are too prone to concentrate all their attention on what might be termed the mere 'mechanism' of public service. They would rather have the praise of another railway official to the effect that they were operating a fine road than to know what the public was thinking about it."

They become so used to the continual petty complaints, when they know that they are giving on the whole a good service, that they refuse even those answers that might be educative. Regulations are posted and the traveling public is expected to conform to them. How readily they would do so if they knew the reason back of each one, and that they were all in the interest of the passengers' safety or their more speedy transportation. Many roads have tested the advisability of a regular educational pamphlet, and find it results in fewer accidents, a better understanding of the rules, quicker handling of crowds, and distinctly better relations; and this counts in a business so dependent on the good opinion of the public. The hard-headed manager may profess to care very little for public opinion and the newspapers, but in the end he will have to pull down his flag. It is through the news columns of the papers in the territory served by his road that the public gets the information by which it forms its opinions; and favorable public opinion is the most effective form of advertising that tends to increase both business and pleasure travel. I will give some specific instances in point.

* "Creating Traffic," STREET RAILWAY JOURNAL, March 11, 18, 25; April 1, 1905.

A high-tension line supplying one division of a large interurban road is down, through no fault of inspection or lack of supervision, and the return of several hundred Sunday school picnickers is delayed thereby until long after dark. The general manager has his coat off, and is doing everything that mortal man can do over telephone lines to locate the trouble or borrow power to move the cars. The reporter for the most influential morning paper comes in. Ten words would have given him enough for an article that might at least have stated, along with the inevitable facts, something favorable for the company that would tend to hold the confidence of the public in the road's ability to maintain schedules. The general manager's distress takes voluble point against the newspaper man, and this is part of next morning's article:

> It was almost impossible to learn anything regarding the trouble or its results, as the officers of the company refused to say a word for publication. General Manager Blank assumed an air of the strictest reticence, giving the impression that the road had had troubles enough of its own of late, he attributing most of them to the newspapers. He declared that he would not tell the reporter a "G—— d—— thing." It was not until the parents of the children who were storm-bound began to pour forth their murmurs of discontent that it was, etc.

This incident has stuck to that general manager, and he has heard of it constantly for three years. It has cost his road the business of many church, Sunday school and secret society outings and the letting of many special cars. The president saw it, and established an "information bureau" where the public through the newspapers could be treated from a business standpoint. When some street railway men do consent to talk for the papers it would be better for the company's dollars had they been muzzled entirely.

Through a newspaper in a large Southern city the editor, bearing a name known the country over, was rasping the local road every day, finally attacking the management, and then individually by name. A friend of both arranged a bloodless meeting where the editor and the general manager became acquainted. The newspaper man found that the street railway man was sincere, and that there was an absolute business necessity for tearing up certain tracks and putting down others, following a consolidation of two lines, with the ultimate result of bettering the service and improving the schedules. The official gave a few good reasons for everything that was done, without telling any more than the public he served had a right to be interested in and to know, and the attacks ceased. And there wasn't any pass at the bottom of it.

In a large city of Western Pennsylvania an afternoon paper made a specialty of having an article every day abusing the street railway service and fitting horns onto the management. Politics did not enter into it in any way. An official of the company took the trouble to relieve the ignorance of the editor along certain lines, showing him that all that was done was really in the interest of the public, and the paper became a strong supporter of the road. Another instance is in the case of an interurban road, the manager of which had publicly expressed his disdain of the effect of newspaper attacks.

saying that the "conservative public" knew enough not to pay any attention to them and that the "thinking part of the community" would know that the company had its side, and that therefore it was not necessary to state it. Matters finally got so strained that it took one man's time visiting the forty newspapers along the line and getting acquainted with the members of the staff and the business managements in the interest of regaining public confidence and showing that the company's effort was to adapt its service to the needs of the greatest number. The traffic receipts began immediately to show the direct result of this change of policy, and the paid advertising columns had no part in it. The system is now one of the most popular in the country, and the people along it refer to it with pride, and do everything they can to expedite a service that they have learned to know is good. They became convinced—despite certain editorials advising them to take their time getting on and off the cars "as it would cut down the company's receipts"—that the very rapid transit that they all desired was being hindered by such methods and that the requests to "step lively" and to "move up front" were in the interest of bettering the service and adding to the comfort of all the patrons.

Would not the thousand and one aggravating changes rung on the phrases "stealing franchises," "taking up the city's streets," etc., cease in great measure if the public was schooled to recognize the simple fact that in every great collection of human beings into what is called a city, spaces between the houses known as streets are set apart so that the population may move to different parts of it? On each side of this thoroughfare a small sidewalk is reserved for those who do not care to go with haste and who prefer to walk. The larger central part is for transportation by vehicles of all kinds—bicycles, wagons and carriages, automobiles, etc. Everyone does not have a carriage for rapid transportation and could not afford its up-keep. Cab service supplies to a great extent this need, but the charge is commensurately high. A company agrees to carry the public for a small price, but to do so it must have the use of the public's streets. If it had to secure a private right of way through a city, buying up property on which to build a road, the public would not have cheap transportation. It would cost 50 to 75 cents a mile to carry them at the same speed. Who uses the streets? The public. To whose advantage, outside of a proper financial return that any business is entitled to, are these street railways operated? The public's. Do street railway investments pay the enormous sums alleged? Census figures and other statistics easily available show that they do not, and that many pass their dividends. Who takes no chances on the investment and—profit or no profit—is the unfailing gainer? The public.

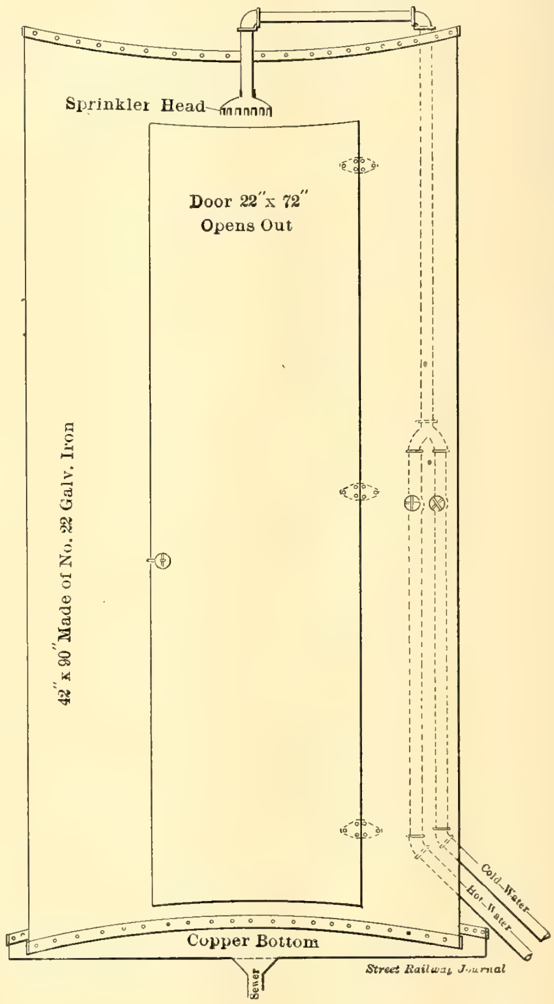
This card house of antagonistic sentiment that has been erected over the silence of street railway managements who let impractical theorists do all the talking would fall at the first breeze of a fair expression of the rights and principles. Politics, of course, influences many papers in their attitude, and their friendship could never be gained; but if the public had a few of these basic facts drilled into them, such frothy fulminations would have no effect.

If the people, step by step, get the opinion that they are being "robbed of their streets," that fares are too high, that transfers should hang on every tree, that conductors are tyrannical, that they are being "hustled" when requested not to block a doorway, that they will gain something somehow by stepping off a car like chickens coming out of a hen-house in the morning and stopping one by one to look at the sun, that they should avoid paying fares, that cars have no right on the rails they run on, that motormen should be "dared" to run over them, who is to blame? If juries can only see one side to a damage suit, as between corporation and individual, regardless of facts, then the "conservative" management—and not the editor who builds up his circulation by catering to public sentiment—is to blame. And don't forget that it costs dollars.

SHOWER BATHS FOR THE MEN

In the issue of the STREET RAILWAY JOURNAL for March 24, 1906, was published a photograph of a "home-made" shower bath installed at the shops by H. S. Cooper, general manager of the Galveston Electric Company, for the convenience of the company's employees. Since the appearance of this article, Mr. Cooper writes, he has had so many inquiries for additional details concerning the baths that he has had a drawing prepared showing the arrangement of the showers and casing. This drawing is reproduced herewith for the benefit of those interested.

Each shower bath consists of a cylindrical casing 42 ins.



DETAILS OF SHOWER BATH BUILT BY GALVESTON ELECTRIC COMPANY

in diameter and 90 ins. high, made of No. 22 galvanized iron. The casing is intended to rest in a copper tray or bottom which is connected with the sewer and prevents water from overflowing upon the floor.

At the top of the casing is a shower head with hot and cold water connections. In the side of the casing is a door 22 ins. x 72 ins., which opens out. Several of these improvised shower baths have been installed at slight expense at the Galveston shops and car houses, and they are very popular with the company's employees.

BRAKE-RIGGING AND UNEVEN WEAR OF BRAKE-SHOES

BY W. L. BOYER

This is something that causes a great deal of expense and trouble for operators, and is one that can be partly overcome by truck builders, if they give the proper attention. It cannot, however, be entirely eliminated on account of the great variation in loads carried on the cars, as the load will change the location of the brake-shoe on the wheel. This, of course, refers to passenger cars only, where equalizer or yoke springs are used. The truck builders in a great many cases are at fault, because they design their truck and brake-rigging without allowing for any compression in the springs. They could avoid this effect by constructing the truck to suit a given weight of car body (furnished by the builder of the car body or by the purchaser) and then adding the weight of the average load of passengers to determine the proper location of the brake-shoe on the wheel. This, of course, is the position in which the shoe is most of the time. The shoe and shoe head should be designed so that pressure would be applied to it in as nearly a central line as possible, taking the center line at the point where the brake-beam fits against shoe-head, as shown in Fig. 1, and applies to the brake-rigging so common on short wheel base trucks where a brake-beam is used, and the pressure is applied to the center of the beam from a live and dead lever. The brake-hanger in this case is also assumed to be suspended from the brake-beam independent of brake-head. The slides and guides to hold the brake-beam level should be fastened to either one of the beams with a slide for the other beam to work in. This reduces the friction, and allows the beams to rise as the shoes wear, for the brake links swing in an arc and raise the beam as the latter swings forward.

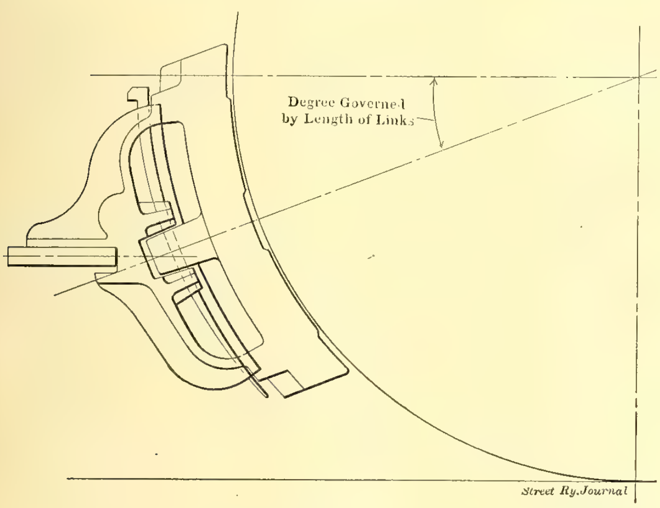


FIG. 1.—SHOE AND HEAD DESIGNED SO THAT PRESSURE IS APPLIED IN A CENTRAL LINE

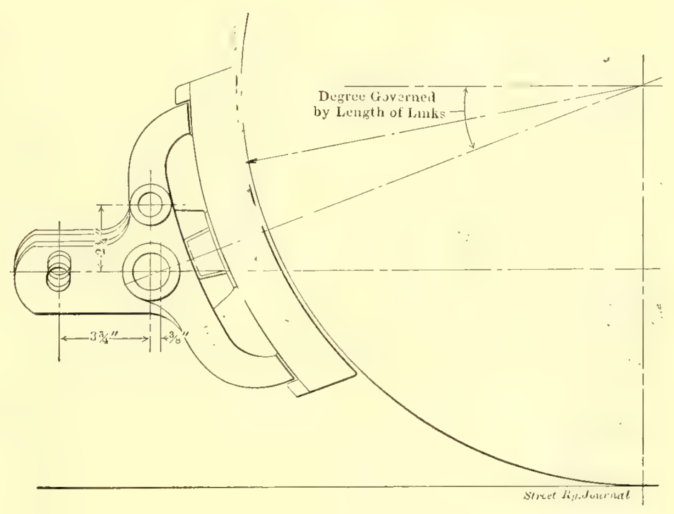


FIG. 2.—PIVOT POINT ON BRAKE-SHOE HEAD A TRIFLE BELOW CENTER LINE OF HEAD

In addition to these conditions, the truck builders, in trying to give the customer the easiest riding truck possible, estimate the yoke or equalizer springs to about one half of their total deflection with the weights given. This varies in trucks from ½ in. to 1¾ ins., according to the length of the spring. The result may easily be seen for the wheel can be assumed as stationary and shoe as moving that distance on the wheel. These springs, the writer claims, should be of greater carrying capacity, so that the change in load would not effect such a change of location for the shoe. This experiment has been tried, and while no difference was noticeable in the riding qualities due to the stronger springs, the brake-shoes kept a more uniform position and when worn out were almost the same thickness throughout.

On longer wheel base trucks, this spring deflection is more serious, for on trucks of the M. C. B. design the springs are usually very long, and of course have a total deflection in proportion. On these trucks no brake-beam is necessary where inside brakes are used, as a tie to hold the shoes in place is all that is required. With this style of truck, two live and two dead levers are used with a curved evener. The brake-hangers are usually connected with links directly with the shoe-head and, as a rule, fastened towards the top of the head, but the same general conditions prevail in regard to shoe wear. The links should be started with about ten degrees' slant, so that the weight of the shoe and head have a tendency to release the brake-shoes from the wheel, independently of any release or kick spring. The pivot point one the brake-shoe head, in this style of brake rigging, should be a trifle below the center line of head to obtain the best results in ordinary service, as shown in Fig. 2. It is very hard indeed to overcome these defects entirely on trucks that are operated in both directions, but no trouble should be experienced to get the brake-rigging right on single ended cars.

There are cases where men in charge of railway shops have been able to reduce the scrap in brake-shoes to a small amount by having a special brake-shoe pattern made to suit their average conditions. These shoes, as a rule, are made thinner on the end which wears slowest, and the only objection the writer sees to this is that it requires two patterns, one right and one left. On a great many trucks, right and left-hand shoes are necessary, especially so on those that do not use a brake-head, and it would be desirable to make them thinner at one end as described.

Where a head is used and where the shoes do not wear evenly, they can be changed from one side of the truck to the other. In this way, a shoe can be entirely worn out, but it is too expensive a method to be considered in practice.

Where shoes wear faster on top than at the bottom, shortening the links will often overcome the trouble, but care must be taken to clear the swing of the bolster and spring plank under extreme conditions. Truck builders usually figure close at this point, so that great care should be taken in making any changes in the length of the links.

A link-supported brake is the best for all general conditions, whether links are of an adjustable kind or not. Several very good adjustable hangers or links that take up the

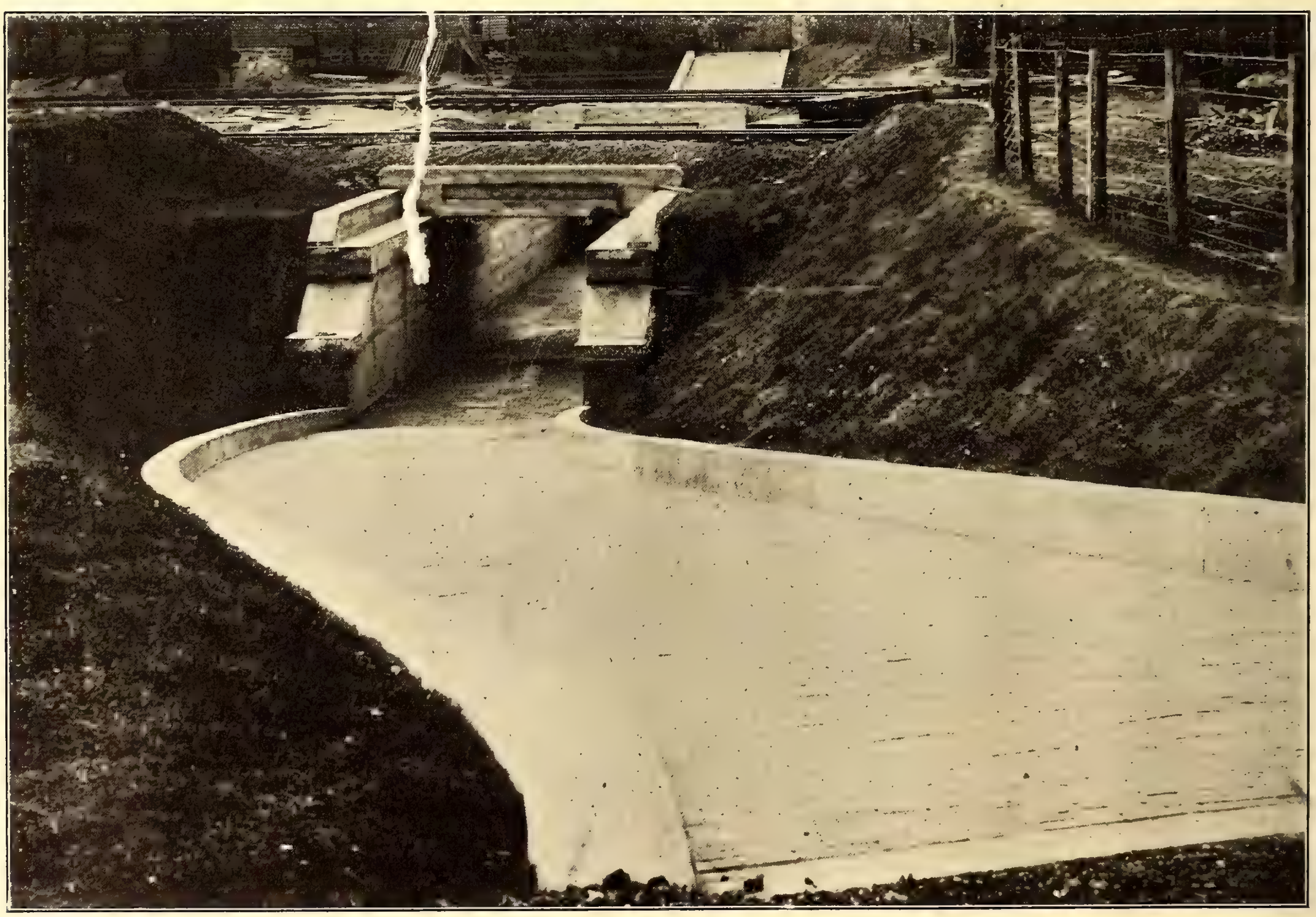
lost motion or play, due to wear, in a very simple and effective manner, are in the market, and are coming into general use.

Leverage is another point to consider, and the writer's opinion is that most trucks are used with too high a ratio. This causes an extra expense to the operator, on account of the frequent adjustment necessary for a high leverage. Since air brakes are used on almost all double trucks, a reduction in leverage would not be noticeable in efficiency of brakes, and would allow a car to stay in service longer before adjustment would be necessary. Some of the air brakes in the market to-day are equipped with slack adjusters, and they would work to better advantage with less leverage, for the shoe could be worn thinner with less piston travel between adjustments.

CONCRETE PASSAGEWAY AT ROCHESTER PARK

In order to give the patrons of Genesee Valley Park the benefits of an additional line to the city without making passengers cross the steam railroad tracks of the Lehigh Valley and Erie railroads, the Rochester Railway Company last year built a subway passage from the park to a loop used by the cars of the South Avenue line on the other side of the railroad tracks. The total length of the passageway is about 350 ft., the subway proper being 150 ft. long, with sloping approaches on 12 per cent grade. The subway is 12 ft. wide and 8 ft. high in the clear under the tracks. The side walls are of mass concrete, averaging 3 ft. in width. The walkway is drained by a 12-in. tile sewer and is paved with brick the entire length and width. It is lighted by incandescent lamps connected with the trolley circuit.

The railroad tracks are carried over the crossing on 18-in. I beams embedded in reinforced concrete. The engraving gives a good idea of the construction and pleasing appearance of the subway.



CONCRETE PASSAGEWAY AT GENESEE VALLEY PARK, ROCHESTER

FOUNDRY WORK ON ELECTRIC RAILWAYS IN THE SOUTH

A number of electric railway companies in the South are following the practice of operating as a regular department of the shops fully-equipped foundries, in which are made practically all of the bronze and iron castings required on the system. Two of the companies, namely the Birmingham Railway Light & Power Company, of Birmingham, Ala., and the Georgia Railway & Electric Company, of Atlanta, Ga., maintain particularly complete foundries, and it is believed the following information on the results obtained by these companies will be of interest.

The foundry of the Birmingham Railway, Light & Power Company is located at the central repair shops and occupies a space 70 ft. x 30 ft. It contains two 24-in. brass furnaces, with a capacity of 1000 lbs. of metal per day of 10 hours; one 30-in. cupola for iron, with a melting capacity of 10,000 lbs. per hour; one No. 4 Sturtevant blower and a tumbler for cleaning castings, both driven by a 7-hp induction motor; one electrically heated core oven; 30 wood flasks of various sizes and 24 special flasks for moulding brake shoes.

The company makes all castings, except car wheels, used in the construction, repairs and renewals of car bodies and trucks, all castings for power station and gas plant, including grate bars, trolley wheels, and car and motor brasses. The brass castings range in size from ¼ lb. to 75 lbs.; iron castings from ¼ lb. to 800 lbs. The formula for making brake-shoes

includes 80 per cent machine scrap, or No. 2 founding pig, to which is added 20 per cent car wheel scrap. The average weight of brake-shoes is 36 lbs. per shoe.

The foundry was put in operation in February, and the following is a statement of the foundry department for the eleven months ending Dec. 31, 1905:

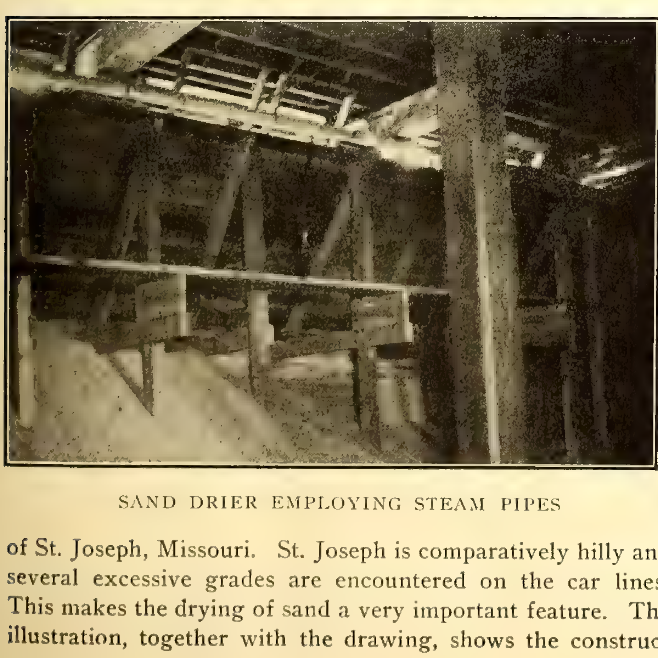
	Brake Shoes	Misc'l Iron Castings	Brass Castings
Output, in pounds, for 1905	138,199	235,819	17,509
Cost per 1000 lbs., 1905	$12.05	$12.05	$167.67
Cost per 1000 lbs., based on prevailing prices in 1904	12.50	20.00	220.00
Total cost for 1905	1,672.09	2,852.61	2,948.07
Total cost for 1904	1,727.48	4,716.38	3,851.98
Profit credited to foundry account over castings purchased at prevailing prices in 1904	55.39	1,863.77	903.91

From the foregoing statement it will be noticed that the foundry operated by the railway company showed a profit of $2,823.07 on all castings over the cost in 1904, based on the then prevailing prices when the castings were purchased in the open market.

The foundry of the Georgia Railway & Electric Company, of Atlanta, is equipped with a full complement of tools and appurtenances. The company has a separate account number for the foundry, and to this is charged all labor and material. All scrap used in this department is charged to the foundry account at market prices, and the account this scrap is taken from is given credit for this value. In this way it is possible to ascertain just what the castings are costing. Based on previous results, prices have been set on all castings made in the foundry at 1½ cents per lb., except for brass castings, which are valued at 20 cents per lb. It is stated for the past four years the foundry has shown a net profit of approximately $100 per month over what it would have cost to buy the same castings in the market. The following is the formula used for making brake-shoes: 40 per cent wheel hubs and spokes; 20 per cent old brake-shoes; 20 per cent wheel rims, and 20 per cent No. 2 pig iron. The average weight of shoes is 35 lbs.

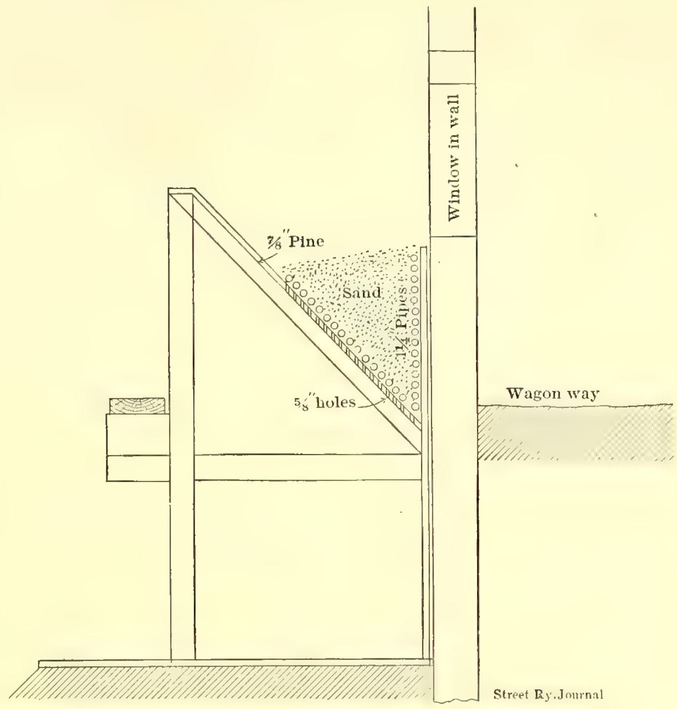
A STEAM SAND DRIER

Several methods of drying sand have been described and illustrated in the STREET RAILWAY JOURNAL within the last year. In this connection is described a sand drier built by F. A. Dillman, master mechanic of the street railway system



SAND DRIER EMPLOYING STEAM PIPES

of St. Joseph, Missouri. St. Joseph is comparatively hilly and several excessive grades are encountered on the car lines. This makes the drying of sand a very important feature. The illustration, together with the drawing, shows the construction of the drier employed. It is built against the rear wall of a car storage shed and extends the full width of the building, about 36 ft. It consists simply of a bin with 1¼-in. steam pipes laid on the bottom and the side, about ¾ in. apart. Steam is supplied from the heater system of the building. The sloping side of the bin consists of ⅞-in. pine, and underneath the pipes it is bored at intervals of about 2 ins. with ⅝-in. holes, through which the sand when dry falls to the floor



VIEW OF SAND DRIER USED IN ST. JOSEPH, MO.

beneath. There is also an opening about ½-in. wide at the point where the sloping side meets the wall through which sand sifts.

Sand obtained from the Missouri River is hauled in wagons and is thrown direct into the drier through windows in the rear wall of the building. No attempt is made to clean the sand before throwing it in the drier, and consequently considerable dirt and rubbish collects in the bottom of the bin. A sliding door near the bottom at one end of the bin facilitates cleaning. The drier has a capacity of about 48 cu. yds. of sand per week, and, with the exception of the occasional cleaning, requires no attention whatever.

LAKE SHORE ROAD TRYING TO RECOVER SHORT HAUL BUSINESS

It is announced in steam-road circles in Cleveland that the Lake Shore and Michigan Southern Railway is preparing for an aggressive campaign to win back the commuters' business which has been going to parallel traction lines. This will mean the short haul business in and out of Buffalo, Cleveland, Toledo, Detroit and Chicago. A map has been prepared showing the territory traversed by the Lake Shore and the competing traction lines, and it is stated that the company will establish commutation rates to accommodate every class of business.

The Central Electric Railway Association has adopted an insignia in the form of a button bearing the letters C. E. R. A. in gold on a dark blue background, encircling a modern interurban car in miniature. The buttons can be secured by members on application to the secretary, J. H. Merrill, Traction Terminal Building, Indianapolis, Ind.

WHITEWASHING A LONDON TUBE RAILWAY

BY ALBERT H. BRIDGE

Ever since the tube railway idea took practical shape, new and interesting problems have been continually presenting themselves for the engineer—electrical and otherwise—to deal with. It was but natural that it should fall to the lot of

INTERIOR OF CAR FOR WHITEWASHING A LONDON TUBE

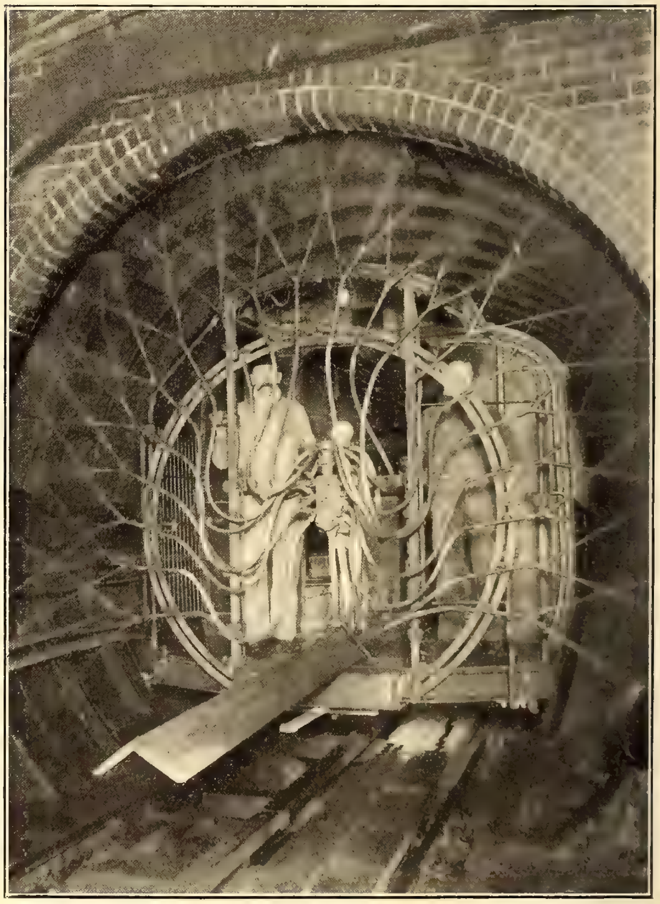
the earlier ones to bear the burden of pioneering work in various directions, and later undertakings have to a considerable extent profited somewhat largely by their experience. In this connection it will be of interest to illustrate the ability to rise to the occasion of one tube railway staff which had to undertake a new duty.

The terminals of the Central London Railroad, and also its permanent way, are under the charge of the Ways and Works Engineer. E. P. Grove, the chief engineer, is responsible for the third-rail and track-rail bonding, and also for the lighting of the tunnels. To him it seemed that this work of his department could be carried out far better if there were improved lighting, and further that the lighting of the tunnels would be more complete if the walls of the tunnels were whitened so as to diffuse the light, which otherwise was confined to the immediate neighborhood of the lamps themselves.

It was evident that any whitewashing would have to be done by machine if it were to be completed within a reasonable time, as the period during which it is possible to do any work in the tunnels is limited from 1:20 a. m. to 4:20 a. m. on weekdays, or to 7:20 a. m. on Sundays. It was Mr. Grover's original idea to get a machine of the usual type supplied by makers of whitewashing and paint-spraying machines, and fix sprays usually hand operated at the end of a car and imitate the hand motion as far as possible while the car was traveling slowly through the tunnel, the machine itself being driven by a motor. Some difficulty was experienced in getting the makers to depart from their standard practice, as they seemed to consider it impossible to get the intermittent motion for the pumps. While this was still under the engineer's consideration, attention was directed to a machine regularly used in the Kentish hop-fields for washing hops, and it was decided to adapt this for the purpose. The road wheels have been removed from the machine and the tank has been mounted in the car with a shaft from which a 6-hp shunt-wound motor is driven. The pump is inside the tank. The head which carries the jets was removed and it was fixed at the extreme end of the car, twenty nozzles being added, making forty in all.

The pump keeps the pressure at about 90 lbs. per square inch, and it is found that at this pressure there is little tendency to choke if the whitewash has been thoroughly sieved. This whitewash is mixed in a large cast-iron tank which forms part of the water-softening plant in the railroad depot, and being close to the track, the car can be readily charged.

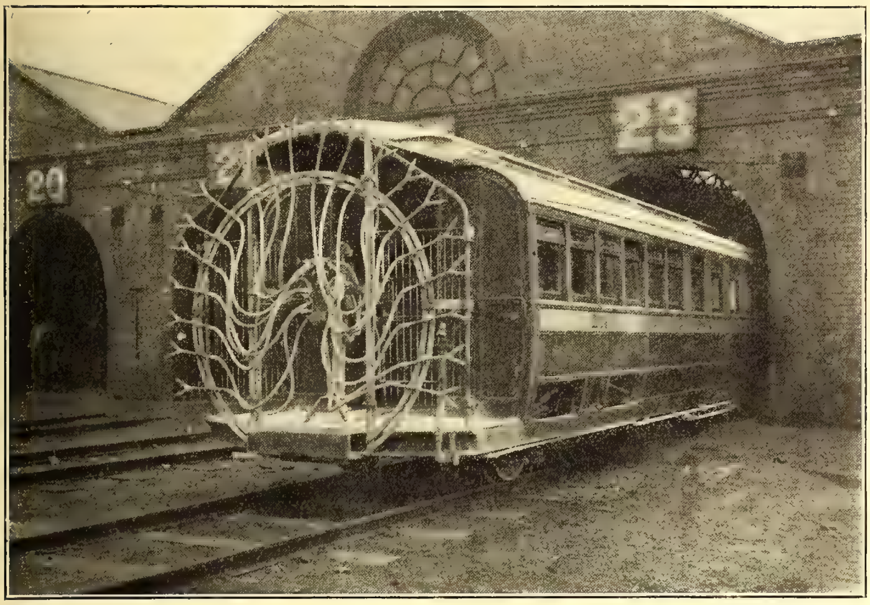
Inside the motor car, which was one of the Central London's own experimental multiple unit cars, a tank was fixed holding about 1200 gallons of whitewash, and this was connected to the small tank containing the pump. This pump keeps the whitewash churned up and well mixed, the cranks



WHITEWASHING MACHINE IN ACTION

and the pump rods being all under the surface of the liquid. By means of resistances, and putting the motors in series, the car can be kept running at a speed of a little over two miles per hour, and at this rate it is possible to do about three-quarters of a mile in forty-five minutes, using about 850 gallons of whitewash and going twice over the work. Previous to the whitewashing, the same machine was used for washing down with water two or three times, so as to remove the dust which had accumulated in the course of five years.

In practice the car goes up to the depot two or three times a night for a fresh supply of whitewash, so that as much as two miles a night have been done. It is not pretended that the finish is as good as could be secured by hand work, but from a sanitary and lighting point of view it has practically the same effect. The labor is considerably less, of course, than required by hand operation.



VIEW OF WHITEWASHING MACHINE ON CAR

For more perfect work, it is Mr. Grove's intention, as originally proposed, to put the nozzles on a rocking frame to give them a radial movement of 18 ins. or so.

CAR INSPECTION IN CLEVELAND

For the past three years the Cleveland Electric Railway Company has employed the scheme of making all car inspection during the day time while the cars are in regular service. Previous to that time, the company employed a combination scheme of making the inspections during the day time and the necessary light repairs at night, the inspectors doing absolutely no work other than reporting on needed repairs which were done at night. The company's system is so arranged that with the exception of six lines the cars of the various lines run directly to the car houses on every trip. On the six lines where there are no car houses, an inspector takes an extra car to the end of the line and each crew changes cars until all the cars on that line have been gone over. On these lines this usually takes two or three hours. On some of the lines the cars have a lay-over of six minutes in the house and the inspectors work during this period. On lines where there are no lay-overs, they have an extra car and work on the different cars the length of time between the headway of the cars. At times it may require two or even three trips before a car is thoroughly gone over.

The company operates in regular active service 652 cars, and has 930 cars in service, including layovers and trippers. It will be remembered that the majority of Cleveland cars are of the convertible type and are used all the year round. In all there are twenty-six inspectors, three of the larger houses having three inspectors, while the others, with the exception of three small houses which have one inspector each, have two. Where there is more than one, the practice is to divide the work, each man taking care of certain kinds of work so that the men become familiar with and expert in their particular task. An inspection includes examination of controllers and replacing contacts, adjusting of brakes and replacing brake shoes, oiling and replacing trolley wheels and poles, cleaning and oiling of motors and replacing carbons, oiling of bearings, but not the changing of bearings and general small repairs and inspections which can be attended to with a few minutes' work. The cars are run over pits for inspections, and at the majority of houses there are loops, so that the cars run through the house; single-end cars are used exclusively in Cleveland.

No record is kept of these small repairs and replacements other than the fact that certain material is used during the day. Where more extensive repairs than those described are needed a report is made on a card and the car is laid up. Four of the car houses are provided with facilities for making light repairs, such as changing armatures and wheels, repairing brakes, etc. They have one carpenter at each of these places who can attend to light carpenter work, and takes care of bell ropes, curtains, straps, etc.; also a man who can do light blacksmithing. For general overhauling or anything more than the repairs mentioned, the cars go to Lake View shops. Cars average 150 to 160 miles per day. Inspectors average twenty cars per day, and they are paid $2.25, so that the cost of inspection is about 11 cents per car per day.

T. Scullin, master mechanic of the company, believes there is no question as to the advantages and economy of day inspection. After the abolishment of the combination scheme formerly in vogue, the company found that it was able to secure better results and with six less men than it had before. Day inspection while the cars are in regular service eliminates the necessity for a great number of pit tracks in a car house and a great amount of switching necessary where all the cars are in the house at once and must be moved to get over the pits. He believes that work done during the day time is always more thorough than night work, and that a man also will do a great deal more work during the day time. The same service can be done with fewer cars because under the day system of inspection a loose adjustment or a broken part can frequently be remedied immediately by the inspector without retiring the car from service.

The system of car cleaning in Cleveland is somewhat out of the ordinary. Cars are swept out each trip by car shifters who come under the transportation department. These men also take care of the stoves in winter and fill the sand boxes. The windows and exterior of the cars are cleaned by car washers who come under the mechanical department. There are about thirty of these, part of whom work days and the others at night. They clean about five cars per day per man. The cars are kept very clean, but there is no set rule as to how often they shall be cleaned, the frequency varying with the character of the weather and the amount of service that a car does.

The Toledo & Indiana Railway has just received a third parlor chair car for use in its limited service between Toledo and Bryan. Although a slight excess is charged on these cars they are proving so popular that the company found it necessary to increase its facilities. The cars were rebuilt from old cars in the company's own shops at Stryker, Ohio.

CORRESPONDENCE

ELECTRIC LOCOMOTIVES IN THE SIMPLON TUNNNL

New York, July 13, 1906.

Editors Street Railway Journal:

Various daily and technical publications have published statements with reference to the breaking down of two electric locomotives on the Simplon Tunnel. These statements have been made so misleading and may be so hurtful to our interests as American representatives of the "Ganz Railway System" that we would feel very much obliged if you would help us correct same by publishing the following in your esteemed periodical:

You are probably aware that, when the Swiss government decided to use electricity as motive power for the Simplon Tunnel, they provided for five electric locomotives. Three of these were loaned by the Italian State Railways, and these were built by Ganz & Co. and have been in operation on the Valtellina Railway. The other two locomotives were built by another manufacturer on an order received originally from the Adriatic Railway for operation on the Valtellina Railway. This order was, however, canceled later on, due principally to the late delivery, and the locomotives were placed at the disposal of the manufacturers, who then proposed to use same for the working of the Simplon Tunnel. The electric operation in the Simplon Tunnel was to commence on June 1, 1906. From that day on the three electric locomotives built by Ganz & Co. have been continuously in service without any trouble, and they are conveying eight trains per day through the tunnel. The other two locomotives have, however, become unfit for the service on the first day of operation, as the motors broke down and the locomotives had to be sent to the repair sheds. For that reason there are not sufficient locomotives available now for working the traffic exclusively by electricity as motive power, and part of the trains will be conveyed by steam locomotives until the two locomotives referred to are repaired and made fit for service again.

In view of the great difference in behavior of the two types of locomotives, it might be interesting to your readers to know that the motors of the Ganz System have their electrical windings hermetically sealed in metal tubes, protecting them not alone against dust and similar substances, but also against moisture and even directly against water. That this protection is most effective seems to be clearly shown by the experience of these locomotives under the trying conditions of the Simplon Tunnel. As a matter of fact, the Ganz three-phase electric locomotives are probably the most robust electric locomotives ever built.

Railway Electric Power Company.

By G. Leve, Second Vice-President.

INTERESTING RECONSTRUCTION WORK IN SAN FRANCISCO

The United Railroads of San Francisco is engaged in an interesting piece of reconstruction work on its Hayes Street line. The conversion of the Hayes Street cable road into an electric line, as in the case of the Sutter Street road, involves the removal of the concrete conduit and the iron yokes that support the old track T-rails and slot rails. Unlike the Sutter Street work, however, the reconstruction is being done largely by machinery.

Chief Engineer Hartwell has arranged a crane and hoist on a construction car, by means of which the iron yokes of the conduit are pulled out of the concrete in which they are imbedded, breaking up the roadbed at the same time. The yokes of the Hayes Street roadbed are made of sixty-pound rails, which stand much twisting and bending without breaking. Thus, in being dislodged from the concrete bed, the concrete is torn out in chunks, and the slow process of digging out the concrete with chisels and sledges, which has been pursued on the Sutter Street line, is obviated.

A short length of 9-in. rail is chained to the protruding tops of a yoke, the rail being of sufficient length to permit of its operation as a lever. The long end of the lever is then grasped by the crane and the yoke is torn from the track. The larger masses of concrete thus dislodged are broken by hand to a size so that they can be passed through a rock crusher, and after being further reduced by the rock crusher, the crushed concrete is put back into the ground as a foundation for the new roadbed. A steam roller will go over the roadbed before the ties and rails are laid, and in this manner Engineer Hartwell expects to secure a solid foundation for the new track that will make the Hayes Street line an excellent piece of electric railway construction.

With the aid of the electric crane a force of sixty track laborers has removed the south track in Hayes Street from Market as far as Laguna. The reconstruction work is progressing favorably, but the officials of the company are making no promises as to when the work will be completed and the new electric line placed in operation. At the rate the work is progressing it will take several weeks to complete the reconstruction.

THERMIT-WELDING IN NEW YORK CITY

The New York City Railway Company has just commenced the welding of joints on its Lexington Avenue line, from Fifty-Ninth Street to Thirty-Fourth Street, by the Thermit process. It is proposed to weld all joints between Ninety-Ninth Street and Thirty-Fourth Street. The work is carried on between 12 o'clock midnight and early morning, and the night cars continue in operation.

NEW POWER HOUSE AT DALLAS, TEXAS

The Dallas Electric Corporation is now completing a new power house adjoining its old power house. The work is being done by the Columbia Improvement Company, which does the constructing work for all Stone & Webster properties. The work is under the supervision of Charles H. Bigelow, formerly connected with the electrical engineering department of the Boston Elevated Railway Company. The new station is to have two 1500-kw., 60-cycle turbo-alternators, as it is to supply both lighting and railways in Dallas.

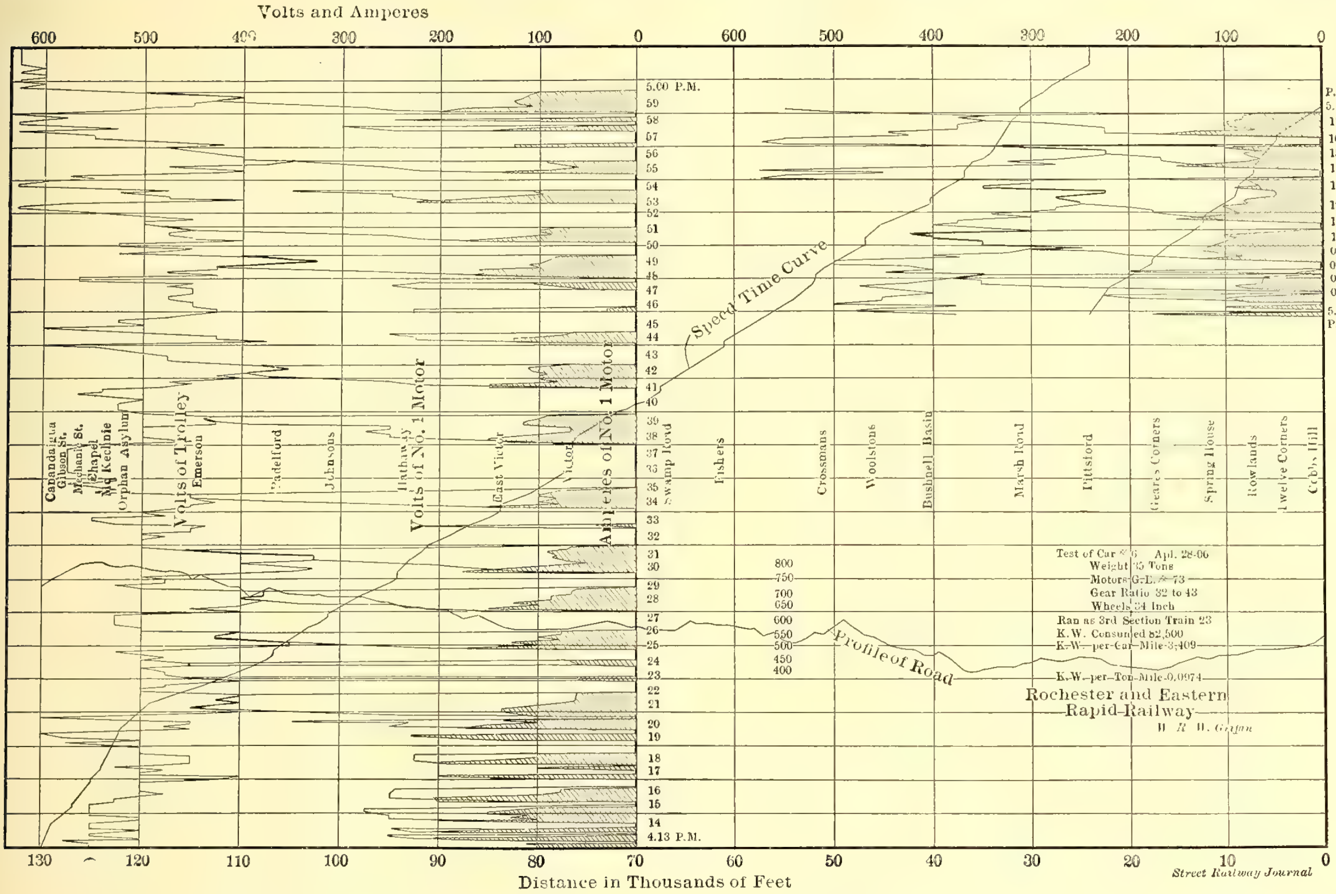
SUNDAY CARS IN MANITOBA

Sunday cars were run for the first time in Winnipeg, Man., on July 8. The service began at 8 o'clock and steadily increased in business till midnight. After dark the cars, especially the open ones, were crowded to excess. The day was the hottest of the year. In St. Boniface, St. Charles and Selkirk and other suburban districts the cars did not run, the company not caring to chance a parallel case to the Brown prosecution of the Toronto company for running cars on Sunday through Toronto Junction.

INTERESTING TEST ON INTERURBAN CAR

Through the courtesy of W. R. W. Griffin, superintendent of the Rochester & Eastern Rapid Railway Company, of Canandaigua, N. Y., the results of a long-distance car motor test are here shown. The test was made on April 28, 1906, on the Rochester City line of the Rochester & Eastern Rapid Railway between Canandaigua and Cobb's Hill, a distance of 24.6 miles.

This car was run as third section of a regular scheduled train making the ordinary stops of that train, the intention being to place the test car under actual working conditions as nearly as possible. The car left Canandaigua ticket office 7½ minutes later than the schedule leaving time of the regular train, made four stops at cross streets in Canandaigua, sixteen country cross-road stops, and two station stops to obtain despatching orders, arriving at Rochester city line 6½ minutes later than schedule time, thus making up one minute over schedule running time. By examining the speed time curve of the chart it will be seen that the stops averaged from 20 to 40 seconds.



RUN SHEET, GIVING THE POWER CONSUMPTION AND SPEED TIME CURVES OF TEST CAR ON THE ROCHESTER & EASTERN RAILWAY

The car was a 52-ft. coach equipped with four GE-73 motors. The gear ratio was 32 to 43, the trucks were fitted with 34-in. steel-tired wheels. The total weight of the car was over 69,000 lbs., or, in round figures, 35 tons without load.

For the test the car was equipped as follows: Armature in series with No. 1 motor; voltmeter across terminals of No. 1 motor; voltmeter between trolley and ground, and recording wattmeter on entire motor circuit of car. The track was staked and numbered every thousand feet. The instruments and distance were read every five seconds.

An examination of the chart will readily show the position of the controller, since the voltage across a single motor is equal to trolley voltage when the motors are in parallel. Computing from the recording wattmeter, it will be seen that the car required 3.409 kw-h. per car mile and 97.4 watt-hours per ton mile.

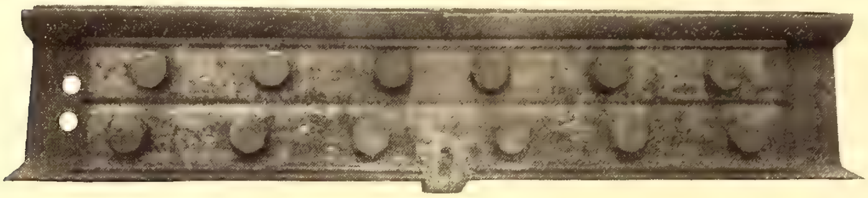
For the benefit of those who wish to study the trolley voltage conditions of the line, it may be stated that sub-stations containing two 300-kw rotaries each are located at Canandaigua, Victor and Pittsford. The trolley is single No. 0000 wire. The feeder is 400,000 circ. mil between Canandaigua and Victor and Victor and Pittsford, and 500,000 circ. mil between Pittsford and Rochester City line. For 7500 ft. west of Canandaigua ticket office the track is laid with 73-lb. Lorain girder rail. The remainder of the track is 70-lb. standard T, all bonded with one No. 0000 compressed bond at each rail joint and cross-bonded every 1000 ft. on about 15 miles of track. The track bonding was broken in several joints between Pittsford and Rochester City line, due to construction work going on.

The train was scheduled and did meet one car at Hathaways and two cars at Pittsford; also a work train between Pittsford and Rochester City line.

The Western Ohio Railway Company has opened a new freight and express station at Wapakoneta. The building is 20 ft. x 75 ft. and has wide platforms on both sides with a switch track running along one side. This will be a distributing point for business to Celina, Mintser and St. Marys on the western branch, and to numerous points north and east. The company is also building small freight stations with spur tracks at Sidney and Minster. The company has recently purchased several cars from the Manhattan Elevated, of New York, and these will be fitted up for express and freight service and used as trailers, eliminating the necessity of double-heading the express runs, which is now frequently necessary to take care of the rapidly growing business.

A VARIATION IN THERMIT RAIL-WELDING APPLIED BY THE CLEVELAND ELECTRIC RAILWAY

Charles Clark, engineer of maintenance of way of the Cleveland Electric Railway Company, has been experimenting for some time with a new type of rail-joint, and is so well satisfied with it that he exhibited samples of the joint at the recent Saratoga convention, and is installing 2000 of them on the lines of the Cleveland Electric Railway Company. In general principle the joint is a combination of the ordinary angle-plate joint with thermit welding to surround the base of the rail. The angle-plates used are the ordinary twelve-hole, 36-in. angle-plates, but instead of using oval holes the holes are drilled round 1 1-16 ins., and are then reamed with an air reamer to 1⅛ ins., and machine bolts are put in with a drive fit.

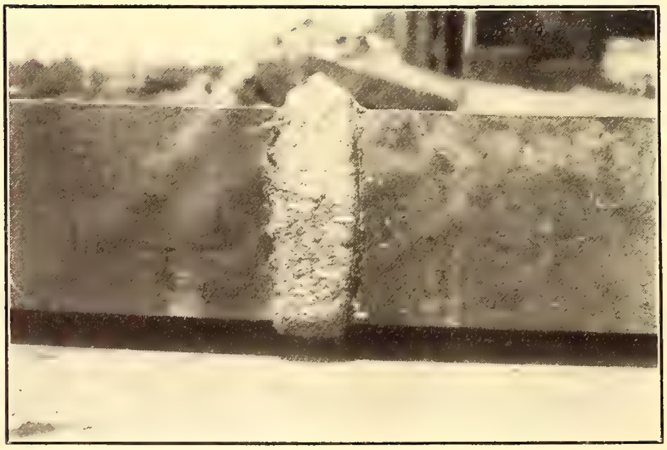


SIDE VIEW OF JOINT, SHOWING FISH-PLATE AND WELD

After the bolts are tightened the thermit steel is cast on by means of a special mold and forms a base plate welding, connecting the bases of the rails and extending over the edge of the angle plate, as shown in one of the engravings. The weld on the base of the rail has a contact of about 5 sq. ins. and an electrical conductivity of about 60 per cent that of the rail, while its shortness gives it a high efficiency as a bond. In connection also with the tight angle-plate it provides as mechanically a continuous rail in any welding process. This combination is considered by Mr. Clark better than any type of entirely welded rail. The process described requires about 7 lbs. of thermit and costs complete about $4.20 per joint.

MOLD USED IN WELDING

For use in the company's supply yards, which were described in this paper some months ago, Mr. Clark has fitted up a home-made traveling derrick which is of great value in handling material about this yard. He rigged up two old single trucks equipped with motors, with a framework across supporting a stiff leg derrick having a 40-ft. mast, 30-ft. lie leg, and a 60-ft. boom. It has a capacity of six tons and travels on two special standard-gage tracks giving a travel of 800 ft., the full length of the yard. One of the trucks was weighted with a lot of old wheels for counter weight, and the operation of the crane and motors is controlled from a platform at the side.



WELD AT BASE OF RAIL

HOME-MADE TRAVELING DERRICK IN CLEVELAND

Frank G. Norveil, assistant general passenger and freight agent for the merger traction lines in Indiana, has completed arrangements with various steam roads whereby joint excursions may be run periodically during the summer to St. Louis, Chicago, Toledo, Detroit and other cities. The plan is to run excursions into Indianapolis from all points, then carry the excursionists to outside points and turn them over to the steam lines at convenient junctions.

PORTABLE VOLTMETERS AND AMMETERS

In addition to the direct current switchboard instruments made by the American Instrument Company, attention is now directed to a series of accurate portable direct current voltmeters and ammeters. These instruments are built on the permanent magnet, moving coil type, although very different in important respects from instruments of the same class made heretofore. By the use of cylindrical steel pivots journaled in the best grade of watch jewels, friction errors which so often occur because of damage in shipment or from jars during continued service are entirely overcome. This method of pivot control is far more difficult to manufacture than the usual conical pivots working in conical jewels; but it is claimed that when once accomplished the instruments of this kind will remain practically frictionless for many years.

The permanent magnets in these instruments are made of magnet steel, hardened and aged in accordance with the most improved methods. The moving systems combine light weight with extreme stiffness, and with the method of pivoting already noted it is impossible for the moving coil to come in contact with the pole pieces or with the core of the magnetic system. By the selection of a proper winding for the moving coils, "American" instruments have a somewhat larger torque than usual, which permits the use of very strong controlling springs. Because of this fact, and also on account of the unique manner in which current is taken into and out of the moving coils, "zero errors" are completely avoided, in ammeters and milli-voltmeters as well as in voltmeters.

The series resistance in American portable voltmeters is wound so as to be perfectly non-inductive, and each instrument has a negligible temperature coefficient. All voltmeters are adjusted to a uniform resistance of 100 ohms per volt, and therefore when multipliers are used they can be interchanged. The measurement of insulation resistance and the location of faults and grounds also are much facilitated, as the necessary calculations are greatly reduced.

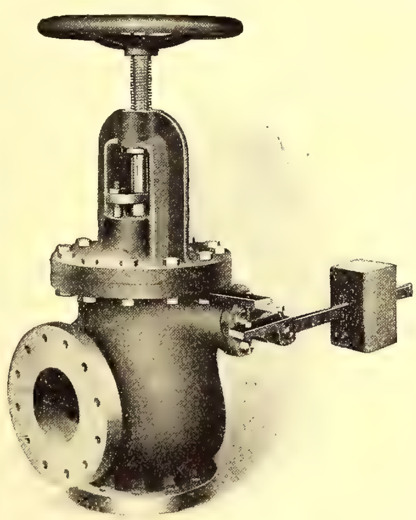
The portable voltmeters are self-contained up to and including 750 volts, but any range beyond that can be provided for by the use of external multipliers. Ammeters are self-contained up to and including 200 amperes. When it is desired to use one ammeter with several ranges, the plan adopted is to employ a milli-voltmeter with separate interchangeable shunts. Each milli-voltmeter with its loads has a resistance of exactly 1 ohm, and will give full scale defection with a potential difference of 50 milli-volts. All ammeter shunts are adjusted for a potential drop of 50 milli-volts at full load. Consequently any instrument can be used with any shunt, or any number of shunts with one instrument. This is a new feature that will be highly appreciated by engineers who wish to make current measurements through a wide range of values.

These portable instruments are made in two types, designated Nos. 4 and 5. Type 4 instruments are provided with special iron shields inside of the wood cases, and can be used close to large generators or under other conditions where an unshielded instrument would be useless. Type 5 instruments lack the iron shield, but in consequence are lighter in weight and somewhat smaller in size.

Voltmeters and ammeters of both types are guaranteed correct within one-half of 1 per cent, and at any time within twelve months after the original shipment they will be tested or recalibrated (if necessary) without charge, if returned to the factory for that purpose. The only condition imposed is that all transportation charges shall be paid by the owner and the instrument seals must be intact.

The factory of the company is located in Newark, N. J., but the general sales office is in Philadelphia, where James G. Biddle, president as well as general sales agent of the company, makes his headquarters.

PORTABLE VOLTMETER



AUTOMATIC BOILER CUT-OFF VALVE

AN AUTOMATIC BOILER CUT-OFF VALVE

The Lagonda Manufacturing Company, of Springfield, Ohio, has added to its boiler room specialties an automatic stop valve which shuts off all steam from the boilers the moment a steam header breaks, or if a boiler tube fails cuts off that boiler from the steam header and localizes the trouble. This valve works equally well either way, and does not depend upon differences in pressure for its action, but upon the actual flow of steam through the valve. In all there are but two moving parts, one of these being the counterbalancing lever and the other a double-heat valve closing upon either side of a double seat.

Normally the upper valve rests upon the seat and prevents steam from the main from entering the boiler. For instance, if the boiler is shut down the valve closes automatically and stays closed while the boiler is emptied or cleaned. When steam is raised it remains closed until the boiler pressure slightly exceeds the pressure in the main, after which the valve lifts and streams flow from the boiler into the main. The valve is very nearly balanced by the weight, and with a slight flow of steam rises to the mid-position. At that point the weight strikes a stop and the mechanism remains in this position permanently while steam is being drawn from the boiler, except if a break occurs beyond the valve, when the excessive rush of steam would carry the lower valve up against the seat, shutting off the boiler. Of course, with any reversed flow of steam the upper valve would drop instantly into its seat and shut off the main.

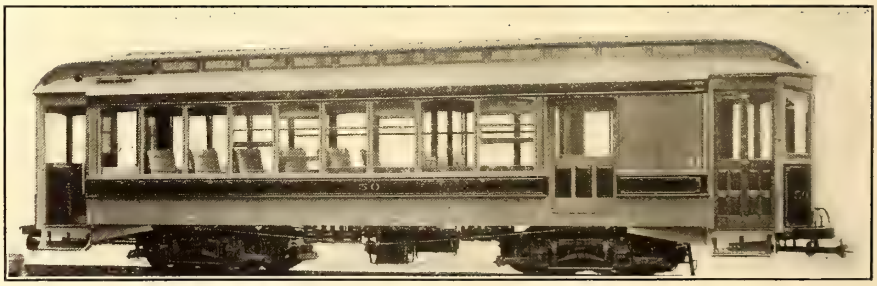
The rate of flow at which the boiler would be shut off is determined by the weight of the valve and the distance between the two valve faces. This is adjusted to correspond to the greatest overload at which it is desired to operate the boiler. This valve can also be used as an ordinary stop valve.

EQUIPMENT FOR NEW LINE AT HAGERSTOWN, MD.

About Sept. 15 next a new line is to be opened between Hagerstown, Md., and Shady Grove, Pa., a distance of 10 miles, 6 miles being in Maryland and 4 miles in Pennsylvania, intersecting at Shady Grove with the Chambersburg, Greencastle & Waynesboro Electric Railway, a line now operated between Greencastle and Waynesboro, and on to Pen Mar, a beautiful resort on South Mountain near the line between Pennsylvania and Maryland, from which two States it derives its name. The name of the new line will be the Hagerstown & Northern, and it will run almost due north from Hagerstown on a private right of way, the maximum grade of which is 3 per cent, and with an average grade of 1 2-10 per cent. It is being laid with 60-lb. T-rail, ties spaced 2 ft. centers, standard gage, with overhead construction of 4-0 trolley with double-pole suspension. Power will be bought from the Hagerstown Railway Company.

PASSENGER COMPARTMENT OF COMBINATION CAR

The new cars for this road are of the combination passenger, smoking and baggage type, one of which is shown in the accompanying view. The J. G. Brill Company, of Philadelphia, is the builder, and the cars embody that company's semi-convertible grooveless-post window system. The cars are particularly interesting from the fact that, although but 32 ft. over the bodies, they have three compartments. The passenger compartment, 18 ft. in length, has a seating capacity for 28 passengers. The transverse seats have high push-over backs with head rolls and corner grab-handles, and are manufactured by the car builder. At the vestibule end of this compartment are longitudinal corner seats for two passengers each, and seats with stationary backs are placed against the glass partition which divides this compartment from the smoking compartment, which measures 6 ft. in length.



COMBINATION PASSENGER AND BAGGAGE CAR FOR THE HAGERSTOWN & NORTHERN RAILWAY

Longitudinal seats are used in the smoking compartment, which will seat ten passengers. A wide sliding door in the partition which separates the smoking from the baggage compartment (8 ft. in length) will usually be left open in cold weather, when the windows are closed, for ventilation, and enables nearly one-half of the car to be used by smokers, and besides affords considerable standing space. The baggage compartment, being equipped with the usual hinged seats, can be occupied by smokers when the compartment is not required for baggage.

The bottom framing of the car includes 12-in. x 3/8-in. sill plates and under trusses stayed by king posts. Air couplers are installed for use when the cars are operated in trains, and heavy channel-iron radial drawbars of the builder's type are used. Other dimensions are: Length of the car over the crown pieces, 41 ft. 5 ins.; width over the sills, including the sheathing, 7 ft. 8 ins.; width over the posts at the belt, 8 ft.; sweep of the posts, 1 3/4 ins.; thickness of the corner posts, 3 5/8 ins.; thickness of the side posts, 3 1/4 ins.; length of the seats, 35 ins., permitting an aisle space of 22 ins. The No. 27-G1 is the type of truck employed, with a wheel base of 4 ft., and the wheels are 33 ins. in diameter with 4-in. axles. The cars are finished in cherry; ceilings of birch.

IMPROVED MOTOR-DRIVEN AIR COMPRESSOR

The accompanying illustrations and description relate to a motor-driven air compressor recently placed on the market by the Philadelphia Air Brake & Machine Company, Philadelphia, Pa. Fig. 1 shows the motor-driven air compressor, which consists of a motor and air pump enclosed in a dust-and-waterproof casing. The motor is a series-wound consequent-pole machine, being of ample size and capacity to withstand overloads and hard service.

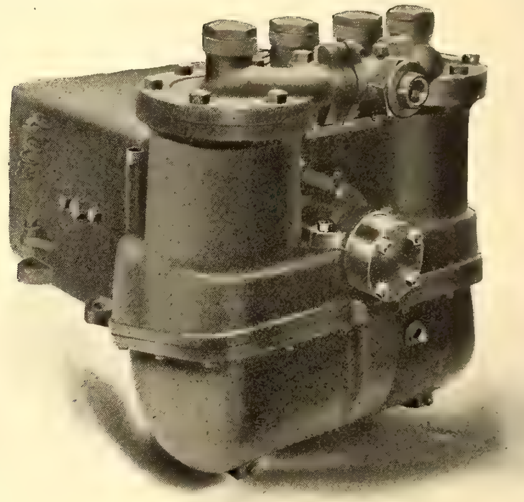


FIG. 1.—MOTOR-DRIVEN AIR COMPRESSOR COMPLETE

The armature is built of Swedish charcoal-iron laminations assembled on a steel shaft. The armature coils are insulated with the best material procurable for the purpose. The commutator is built of drop-forged copper bars, insulated with India mica and assembled on a brass shell. It is made of

ample size to withstand mechanical strain and wear. The fields are constructed in such a manner that there are no unnecessary cross-connecting wires in the motor, the terminals going direct to the brush holders and trolley and ground.

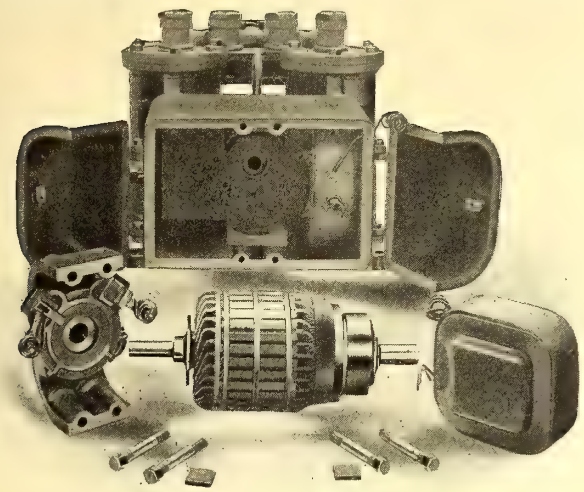


FIG. 2.—MOTOR DISSEMBLED

On the end of the armature shaft is screwed a clutch which engages with a mate on the worm pinion; by this method an armature can be removed in two minutes' time and replaced in three minutes. The armature is supported on a bearing yoke at the commutator end which is fastened to the casing by four bolts. Around the neck of this yoke is fastened the brush-holder collar. The motor is enclosed by two dust-proof doors, which give easy access for inspection and repairs.

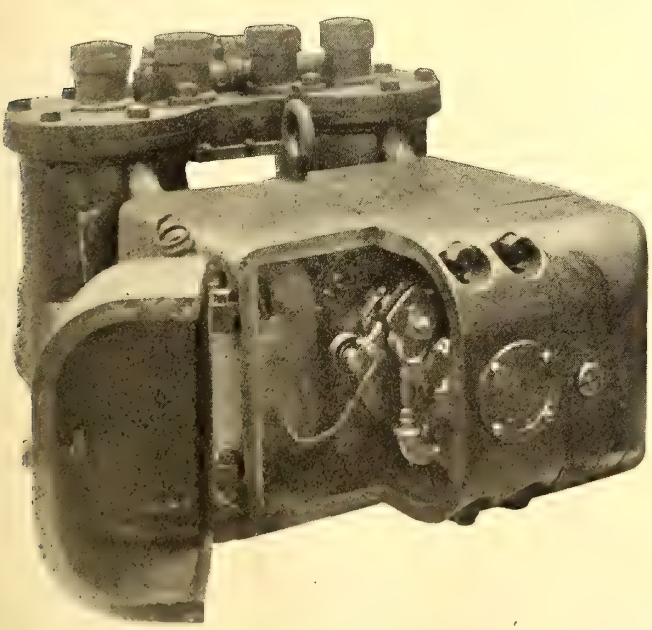


FIG. 3.—ONE OF THE MOTOR DOORS OPEN TO GIVE ACCESS TO INTERIOR

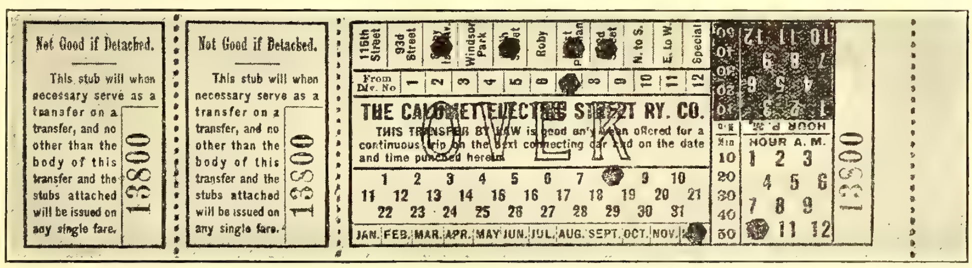
The compressor has all the good features of the company's older type, and several new ones which will appeal to the practical railroad man. The compressor is of the vertical type, the advantages of which are reduced friction on the cylinder walls, the weight of the pistons being balanced against each other, and the wear being distributed evenly around the cylinders, thus preventing them wearing elliptically. The valves are placed in the head in such a way that the amount of air cushioned or pocketed is at a minimum, thus avoiding considerable loss by the expansion of this air on the return stroke. The suction and discharge valves are arranged on the cylinder head so as to be accessible for inspection or regrinding, and are interchangeable.

By the use of the Hindley worm and wheel transmission the company says it has accomplished results in economy and life that can not be equaled by any other system of transmission.

It is recommended that the motor be placed under the car, and as no boxing is necessary, the whole makes a very neat appearance.

A NOVEL TRANSFER

Many of the points of intersection of the lines of the Calumet Electric Street Railway, of Chicago, are so far distant from each other that in order to give sufficient accommodation to passengers it has been the custom heretofore to give a transfer on a transfer. It was discovered, however, that undue advantage was being taken of this arrangement by many peddlers, traveling men and others, who would ride from point to point, getting a transfer each time, and in fact would spend a whole day riding on the several lines by the payment of one fare.



TRANSFER TICKET WITH COUPONS ATTACHED TO PERMIT THREE TRANSFERS

To prevent this abuse and still permit a passenger to go from any portion of the single-fare district to any other portion for one fare, H. M. Sloan, general manager of the company, has issued the novel transfer illustrated. The body of the transfer is very similar to those commonly issued by other roads. The addition of the two stubs, however, makes it distinctive. By its use it is possible to ride on four different lines, transferring three times.

The conductor issuing the transfer punches his own line and division number, and the line that will bring the passenger to his final destination. The second conductor removes one stub and punches his own line. The next conductor removes the remaining stub and likewise punches his line. When presented to the next conductor, that one on the car bringing the passenger to his destination, the transfer is taken up and it is of course impossible for the passenger to proceed farther without the payment of another fare.

The transfer in the end contains a complete record of the passenger's travel. The punchings of the transfer illustrated show that the passenger obtained the transfer on division 7 of the 103d Street line. He was transferred successively to the West Pullman line, the Seventy-fifth Street line, and finally to the Stony Island Avenue line, which took him to his destination.

The first form of this transfer issued had but one stub. This, however, was found to be objectionable, and the form shown was substituted.

FINANCIAL INTELLIGENCE

WALL STREET, July 18, 1906.

The Money Market

There has been very little change in the monetary situation during the past week. The demand for money has been somewhat smaller if anything, and although the tone has been easier, rates for all fixed periods ruled practically unchanged from those prevailing at the close of last week. Money on call has been in plentiful supply at rates ranging from 3½ to 1½ per cent, the lowest rate for the year, the average for the week being about 3 per cent. In the time loan department money was offered with more freedom, especially for the over-the-year maturities, and was obtainable at 5½ per cent, while in certain quarters accommodations could be had at 5¼ per cent, where choice collateral was offered. At the present time there is nothing in the situation to warrant the expectation of any decided change in conditions in the near future. The banks show a heavy gain in cash for the week, but this will probably be offset by the repayment to the Government by the banks of the special deposits made last March. The position of the New York banks, however, has been materially strengthened by the heavy receipts of gold from the Klondike and from Alaska, and it is expected that substantial amounts of the yellow metal will be imported from Europe. So far this week $2,000,000 has been obtained in the London open market for shipment to this side, and the engagements of further substantial amounts are likely to be announced in the near future. On July 20 the Secretary of the Treasury will sell $30,000,000 2 per cent Panama Canal bonds; but assurances have practically been given that the greater part of the proceeds derived from this sale will be redeposited in the banks. The European markets have been steady, with rates for money and discounts practically unchanged. The bank statement published on last Saturday was extremely favorable. Loans decreased $14,344,700, due in part to the shifting of loans to foreign bankers and trust companies. Cash increased $3,262,000. Deposits were $12,411,700 smaller than in the preceding week, thus reducing the reserve required by $3,102,925. The surplus reserve was increased by $6,365,725, making the total surplus $12,830,800, which compares very favorably with the reserves held in corresponding periods of former years. In the corresponding week of 1905 the surplus reserve was $19,523,250, $44,563,350 in 1904, $13,278,475 in 1903, $15,709,275 in 1902, $21,029,375 in 1901, and $19,960,125 in 1900.

The Stock Market

There has been a decided improvement in the stock market during the past week. Trading was only moderately active, but sentiment was more cheerful, and the buying during the last half of the week was considered better than for some time past. The improvement was due in part to the resumption of gold imports from Europe, and to the fact that the local banks have gained substantially from the Sub-Treasury on the week's operations. The bank statement of Saturday was remarkably favorable, and showed an unexpected large increase in surplus reserves, which at the time was practically ignored. On Monday more consideration was given to this feature, and while the money market is likely to work somewhat close for the time being, owing to the flotation of the Panama Canal bond issue of $30,000,000, the New York City stock issue of $12,500,000 and the return of $10,000,000 of public deposits to the Treasury, the fact that Secretary of the Treasury shows a disposition to increase public deposits in national banks has served to cause less apprehension of any monetary stringency. Some estimates place possible gold imports during the balance of the year at $50,000,000, and the very favorable trade statement for the fiscal year indicates that we have a large credit balance on the other side to which must be added the proceeds of the Pennsylvania loan. Speculative interest has centered in Amalgamated Copper, which, after a sharp decline, turned and moved up very rapidly about 5 points. There has been much uncertainty regarding possible dividend action on this stock, but the general opinion favors the declaration of dividend at the rate of 8 per cent per annum. There was a demonstration against the shorts in Brooklyn Rapid Transit, the Hill and Harriman stocks and the steel shares, and towards the end of the week the market had broadened out somewhat, and at the higher level of prices the market was well sustained. Thus far there has been nothing to indicate that banking interests are yet prepared to take an aggressive position in favor of an upward movement, but two prominent bankers are due to arrive here next week, and it is expected that their return will be followed by more aggressiveness on the side of higher prices. Fundamental conditions are all decidedly favorable. Crop advices are encouraging and indicate large harvests. Railroad earnings are all large, and all the industries report unusual activity. Speculation has been influenced by rumors that the Union Pacific would buy control of the St. Paul, that the iron ore deal will be completed on the return of certain interests, and that before the political campaign opens there will be a cessation of attacks upon corporations.

The selling of Brooklyn Rapid Transit, based on the efforts to compel a 5-cent fare, simply created a short interest, and it does not appear that the Railroad Commissioners will decide in favor of the advocates of the lower rate. Interborough has been dull and weak.

Philadelphia

Increased dullness characterized the dealings in the local traction stocks during the past week, and prices with few exceptions displayed a declining tendency in sympathy with the weakness prevailing in other quarters of the securities market. Trading in Philadelphia Rapid Transit was extremely quiet, about 2000 shares changing hands from 30½ to 29¼. Union Traction was also easier, about 400 shares selling at 63½ and 63¼. Philadelphia Company common, after selling at 48¼ at the opening, ran off to 47½, and then recovered to 48. Philadelphia preferred was entirely neglected. Consolidated Traction of New Jersey sold at 79 for odd lots, and small amounts of United Company of New Jersey brought 260 and 258. Philadelphia Traction was strong, with sales at 98½ to 99.

Baltimore

Trading in the Baltimore market was broader than for some weeks past and prices generally ruled strong. United Railway issues were again the leading features in point of strength, due to the belief that the plan for refinancing the company will be announced soon, and that it will be favorable to the income bondholders. The 4 per cent bonds sold to the extent of $30,000, at 92¼ and 92⅛. The incomes rose from 73¼ to 73⅞, on light purchases, while the certificates representing income bonds deposited rose from 71½ to 72. The free stocks sold at 16¾ for nearly 1000 shares, while the stock certificates of deposit advanced from 15⅞ to 17⅛. Lexington Street Railway 5s displayed greater animation and strength, $15,000 changing hands, from 101¼ to 101⅝. Other transactions included Washington City & Suburban 5s at 105½, City & Suburban 5s at 112¼, Norfolk Railway & Light 5s at 99¼, and an odd lot of Norfolk Railway & Light stock at 19.

Other Traction Securities

The market for street railway issues at Chicago was unusually dull. The trading included only a few issues, but prices as a rule held firm. South Side Elevated rose a point to 96. North Chicago brought 33 for a small lot, and sales of West Chicago were recorded at 25½. Chicago Union Traction was weak, several hundred shares selling at 4. The Boston market also was quiet, and apart from Massachusetts Electric issues price fluctuations were extremely narrow. Massachusetts Electric common, after selling at 19½, broke to 18, while the preferred fell from 69 to 67¾, and moved back again to 68½. Boston Elevated was unchanged at 152. West End common sold at 95 and 96, and the preferred at 110. Boston & Worcester preferred brought 77 for several hundred shares. In the New York curb market the only transaction during the week was in Public Service Corporation certificates, $5,000 of which sold at 67¾.

Tractions were very quiet in Cincinnati. Cincinnati, Newport & Covington common as usual lead in the trading, about 600 shares selling at 73 to 73½, a fractional decline from last week. Cincinnati Street Railway was up a point from 142 to 143. Cincinnati, Dayton & Toledo 5s sold at 93.

Aurora, Elgin & Chicago common lead in the selling at Cleve-

land, with a range of from 34½ to 34¾. The preferred sold at 77¼. Cleveland Electric was comparatively inactive at 75¼. Lake Shore Electric sold at 16⅞ for the common and 66 for the preferred. There was considerable trading in Western Ohio 5 per cent bonds, which advanced from 82 to 83½, the strong point in favor of this security being the fact that the company is about to take over the Lima, Findlay & Toledo Company's preferred stock, which will add 32 miles to the system without increasing the bonded indebtedness. Northern Ohio Traction & Light 5s sold at 87¼, and Aurora, Elgin & Chicago 5s at 98½.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks and the active bonds as compared with last week:

	July 11	July 18
American Railways	52⅛	52⅛
Boston Elevated	152	152
Brooklyn Rapid Transit	73⅝	73½
Chicago City	—	160
Chicago Union Traction (common)	4⅛	3⅝
Chicago Union Traction (preferred)	12¼	12
Cleveland Electric	81	—
Consolidated Traction of New Jersey	77	78
Detroit United	92	90
Interborough-Metropolitan, W. I.	35	35¾
Interborough-Metropolitan (preferred), W. I.	73¾	73⅛
International Traction (common)	a55	a54
International Traction (preferred), 4s	79	79
Manhattan Railway	148	148
Massachusetts Electric Cos. (common)	18	18½
Massachusetts Elec. Cos. (preferred)	a69½	68
Metropolitan Elevated, Chicago (common)	26	26
Metropolitan Elevated, Chicago (preferred)	67	66
Metropolitan Street	—	—
North American	92¾	93
North Jersey Street Railway	27	27
Philadelphia Company (common)	48⅝	47¾
Philadelphia Rapid Transit	30	29
Philadelphia Traction	99	98¾
Public Service Corporation certificates	67	67¼
Public Service Corporation 5 per cent notes	95¼	95½
South Side Elevated (Chicago)	96	95
Third Avenue	124	124
Twin City, Minneapolis (common)	113	113
Union Traction (Philadelphia)	63	63
West End (common)	—	—
West End (preferred)	—	—

a Asked.

Metals

The pig iron markets continue firm. In the Chicago district a great deal of business to cover the year is being booked, and a strong revival of buying is reported in the Pittsburg district. Foundry irons are strong, with some interests quoting higher prices. Steel-making irons are in great demand, and prices rule firm. A revival of buying in railroad material is also reported. Locomotive and car manufacturers report that business is coming in freely for 1907. Copper metal is quiet, and prices are somewhat below those prevailing at the close of last week. Lake is quoted at 18⅜ and 18⅝c., electrolytic at 18 and 18¼c., and castings at 17¾ and 18c.

CLEVELAND ELECTRIC APPEALS TO PUBLIC

The question of franchise renewals for the Cleveland Electric is likely to be submitted to a vote of the people. President Horace Andrews, of the Cleveland Electric Railway, has announced that the company's proposition for renewals of franchises will be sent to the City Council on July 24. The proposition will involve not only a reduction in the rates of fare and concessions in the matter of transfers, but will provide for extensions and for at least two new cross-town lines. It will also contain a proposition relative to the building of a subway to the East End, which will relieve the traffic in the congested business district. Accompanying the proposition will be a request that the entire matter be left to a vote of the public, and the company will agree to pay all expenses of placing the question on ballots and submitting it to the public. The company will endeavor to secure an expression of public opinion whether or not the result will be binding upon the City Council.

It is predicted that if this question ever does come to a vote of the people, and the company's proposition involves a reduction of fare to seven tickets for a quarter, or even six tickets for a quarter, with liberal transfer privileges, that the popular settlement will be overwhelmingly in the company's favor. The public of Cleveland is thoroughly tired of the long-drawn controversy, the experiments which have been made, and the disinclination of the old company to make needed extensions until the question is settled, and would be pleased to have the question settled definitely on a reasonable basis at the earliest possible moment.

PROSPECTS OF MERGER OF NORTHERN OHIO PROPERTIES

There is a well defined understanding in Cleveland financial circles, that before many months have passed a comprehensible combination of traction properties throughout Northern Ohio, and possibly Michigan, will be effected. The prime factor of the consolidation will be the Everett-Moore syndicate, which has now regained practically all the traction properties which it lost at the time of its embarrassment four years ago. The Everett-Moore people are now negotiating to regain control of the Cleveland Electric and if this property is secured it is thought that a gigantic merger will speedily follow. Such a merger was the chief aim of the Cleveland syndicate before its financial troubles. The consolidation of the interurban lines in Eastern Michigan into the Detroit United System was an important step in this direction, and a larger merger was to have followed soon.

In addition to the properties which it controls at the present time there are indications that other properties controlled by friendly interests will be included, a community of interests being thought to exist between the Everett-Moore syndicate and the Pomeroy-Mandelbaum syndicate, which have come to an agreement for the building of a line from Fremont to Fostoria, Ohio. This line will connect the Lake Shore Electric with the Western Ohio, the latter a Pomeroy-Mandelbaum property. There are also renewed reports of plans for the consolidation of the Lake Shore Electric and the Cleveland & Southwestern system, the latter being the most important Pomeroy-Mandelbaum property in the State. An extension of the Cleveland & Southwestern will soon connect with the Ohio Central, another of their properties, and this in turn will connect with the Columbus, Delaware & Marion Railway, a Columbus road which has repeatedly declined propositions from the Schoepf syndicate, which is gathering up all the traction lines in the central part of the State. It is believed that the Webb interests, which control this property, would be apt to cast their fortunes with the Cleveland syndicate, as their line forms part of the logical route from Cleveland to Columbus.

The merger, if effected, will combine a group of properties greater in earnings and mileage, both city and interurban, than any community of interests that has yet been effected, not even excepting the tremendous acquisition of the Widener-Elkins-Schoepf syndicate, which has gathered in nearly all the important traction properties of Indiana and Central Ohio. This can be seen by the accompanying table showing the properties, their stock and bonds.

Everett-Moore Properties	Miles	Stocks	Bonds
Cleveland, Painesville & Eastern	46	$2,000,000	$2,500,000
Cleveland, Painesville & Ashtabula	30	1,000,000	1,000,000
Lake Shore Electric Railway	200	7,500,000	7,000,000
Avon Beach & Southern Railway	12	300,000	300,000
Lorain Street Railway	11	750,000	750,000
Northern Ohio Traction & Light	105	7,500,000	7,500,000
Canton-Akron Railway Company	57	2,000,000	2,000,000
Canton & New Philadelphia Railway	21	600,000	1,000,000
Tuscarawas Traction Company	13	350,000	350,000
Toledo Railways & Light	120	12,000,000	12,000,000
Maumee Valley Railway & Light	20	1,000,000	1,000,000
Detroit, Monroe & Toledo Short Line	75	3,000,000	3,000,000
Detroit United Railway	350	12,500,000	25,000,000
Detroit & Port Huron Shore Line	125	2,500,000	2,500,000
Pomeroy-Mandelbaum Properties			
Cleveland & Southwestern	135	5,000,000	3,000,000
Cleveland, Ashland & Mansfield	46	1,500,000	1,500,000
Ohio Central Traction Company	30	750,000	400,000
Western Ohio Railway	112	3,000,000	3,000,000
Columbus, Delaware & Marion	101	2,500,000	2,500,000
Cleveland Electric Railway	230	23,400,000	16,000,000
	1,839	$89,150,000	$92,300,000

NEW YORK TRANSIT ROUTES APPROVED BY COURT

The Appellate Division of the Supreme Court has approved all the plans for the $450,000,000 system of rapid transit roads, conditionally upon the Board of Rapid Transit Commissioners deciding within two years which of the routes they have concluded finally to construct. This will enable the Board to take the condition of the city's finances into consideration to determine which routes should be built. After that, the court holds, if the Board finds itself able to construct more roads application must be renewed to the court. This will render null and void the approval of all routes not selected and contracted for within two years.

Decision was given in the matter of the application of the Rapid Transit Board on the proposed Third Avenue route and eighteen others. Judge O'Brien, presiding, writes the opinion, in which all the judges concur, and which states:

It is agreed on all hands that transit facilities should be furnished as speedily as possible, and that the extent of the facilities to be furnished should in some degree be proportionate to the rapid growth of our population throughout the greater city. Upon the question of the present necessity for all of the routes proposed we find no grounds for differing from the conclusion reached by the Rapid Transit Commissioners, and were there no other question involved our duty would be simple and plain.

There is, however, involved another and very serious feature, and it relates to the financial ability of the city to undertake the proposed construction. It is shown by the record before us in the Third Avenue case that the nineteen routes of subway will cost $300,000,000 for construction and $150,000,000 for equipment, or a total of $450,000,000.

Under the restriction imposed by the constitution, the total borrowing margin of the city, most favorably viewed, did not exceed on Jan. 1, 1906, $61,000,000. If we can look at the future, there is a likelihood, in view of the increased values of property, that the city will have a debt incurring capacity between Puly 1, 1906, and Jan. 1, 1907, of something like $110,000,000. And if all of it were appropriated for rapid transit construction there would be nothing left for the other departments of the city government, which in expense and importance are increasing and expanding from year to year.

Probably no prudent city administration would deem it wise, in the present condition of its financial affairs, to commit it in the near future to an expenditure for rapid transit exceeding $50,000,000.

It is well known that at this time a percentage of the children of this city are denied proper schooling by reason of the limited facilities. What may be said of the limitations that may be entailed upon future generations if by the supposed necessities of rapid transit the credit of the city should be so impaired as to make it impossible for proper provision to be made for schools and the other various municipal needs, such as proper policing, fire service, paving, etc.?

Again by the adoption of the proposed plan, and the practical monopolizing of all the city's streets, wedded to a single scheme or idea of transit construction or management, the people are practically forever excluded from asserting and exercising a right which has much of reason and argument in its support, to wit: to own and operate their own municipal subways.

To have property affected by the approval of a route which might never be built, acting as it would as a notice to all that the street was appropriated for railroad purposes, would impede the development and improvement of property along its lines.

In the subway built the city advanced for construction more, as events proved, than was absolutely necessary for construction proper, and this excess was available to the contractors, who were bound and from their own funds agreed to advance the moneys needed for the equipment and operation of the road. The feature, however, that was undoubtedly most attractive to bidders was the lease obtained for a period of fifty years. Under the Elsberg bill the lease of subways is limited to twenty years.

Regard being had, therefore, to these different and conflicting interests, we think the right solution, so far as it rests with this court, will be to approve all of the routes conditionally, upon the Rapid Transit Commissioners deciding within two years which of them they have finally concluded to construct. This will enable them, within the period named, in view of the then existing condition of the city's finances, to determine just what routes should be built, and after that time they should be required, if able to construct other routes, to renew their application to this court. This will render null and void our approval of all routes not selected and contracted for within the said two years

TRACTION AFFAIRS IN CHICAGO

At a meeting of the committee on local transportation of the Chicago City Council, held July 15, President Mitten, for the Chicago City Railway Company, and General Counsel Gurley for the Union Traction Company, promised to submit to the committee by Sept. 15 next the valuations of the intangible property of their respective systems. The valuations for each road will be given in lump sums, the officials refusing to submit figures on the valuations of the unexpired franchises on each street and parts of streets. The Council committee want the values claimed by the companies for each street. At a previous meeting, at which the city officials contended that the values be given in detail, John P. Wilson, speaking for both of the railway companies concerned, said:

"It is a mixed question of law and fact. We have certain rights in some important streets as to the legal status of which there is no possibility of the city and ourselves ever agreeing. The city has one view of the law and we have another. It is an open question.

"The city is in possession of all the facts in the case. It has all the ordinances under which we claim rights and its own lawyers to interpret the law for it. Anything we could furnish would be nothing more than you have now, and it would be a waste of time for us to try and get together on the legal contentions."

The bids received by the Union Traction Company, on July 5, for lowering the La Salle Street, the Washington Street and the Van Buren Street tunnels, it is reported, will be rejected, and new bids will be asked for. The War Department is not satisfied with the plans upon which the bids were based, but insists that the top of the La Salle Street tunnel shall be 5 ins. lower than provided for, the Washington Street tunnel 7 ins. lower, and the tunnel at Van Buren Street 10 ins. lower.

NEW HAVEN OUTLINES A HARTFORD, BRISTOL AND WATERBURY ELECTRIC SERVICE

A proposition has been received by Mayor Henney, of Hartford, Conn., from President C. S. Mellen, of the Consolidated Railway Company, which operates the electric railway properties of the New York, New Haven & Hartford Railroad, which, if accepted by the city, will mean a rapid trolley service between Hartford and New Britain and Bristol, and ultimately Waterbury. The proposition is that the Consolidated be permitted by the city to build a line with T-rails from a connection with the New England Railway, through Imlay Street, Farmington Avenue, Ford and Pearl to Main Street, thence north on Main to High Street, and south on High to Asylum, thus forming a loop taking in the principal business section of the city.

In his reply to the proposition of President Mellen, Mayor Henney offers an opportunity for a full consideration of the matter, and gives the citizens who may be interested, as well as the Consolidated, a chance to be heard. He suggests a meeting for July 23, at which time it can be determined how the matter is looked upon by the city and the company.

President Mellen's letter is as follows:

New Haven, May 10, 1906.

Hon. W. F. Henney, Mayor, Hartford, Conn.

My Dear Sir:—The Consolidated Railway Company respectfully petitions for the right to lay a double-track line from a connection with the New England Railroad, crossing Hawthorne Street, thence through Imlay Street, connecting with its present tracks in Farmington Avenue, thence via Farmington Avenue and Asylum Street to the intersection of Ford and High Streets. Thence through Ford Street and Pearl Street by single track to Main Street, thence through Main Street to High Street, thence through High Street by single track to an intersection with the present tracks on Asylum Avenue.

The new tracks to be laid with T-rail of the pattern shown in the blueprint herewith. The present tracks in the streets named to be relaid with a similar T-rail.

The object of furnishing tracks with a T-rail of the standard shown by blueprint above referred to is to enable the company to move cars of the M. B. C. standard wheel from a connection with the New England Railroad through a loop by the streets mentioned, returning to said connection, thence using the tracks of the New England Railroad from the point of said connection to Bristol, and, when the double track now under contract between Bristol and Waterbury is completed, to Waterbury.

Assuming that such permission is granted by the proper authorities of the city, we undertake, as soon as the work may be done, to prepare the tracks of the New England Railroad between the point of connection at or near Imlay Street for operation by trolley, and the cars thereon operated to all make the loop through the streets of Hartford before outlined, substituting the proposed service for the present, and that we have been obliged to discontinue temporarily through the injunction recently granted enjoining further operation of the third-rail service.

I am addressing this application to you, assuming that you will refer the same to the proper authorities of the city for consideration, and we hope to be advised of any time appointed for a hearing that the company may be properly represented and know that the objects sought to be accomplished are properly laid before the authorities of the city.

Very respectfully,

C. S. MELLEN, President.

FALL MEETING CENTRAL ELECTRIC ASSOCIATION

The Central Electric Railway Association will open its fall campaign with a meeting, on Sept. 26, at Robinson Park, near Ft. Wayne, Ind., a resort on the lines of the Ft. Wayne & Wabash Valley Traction Company, selected in order to give the members an outing as well as a meeting.

At a recent meeting of the executive committee of the association a committee of three, consisting of President E. C. Spring, Vice-President Henry and H. A. Nicholl, was appointed to transact business for the entire executive board during the balance of the year. This will enable the association, through Secretary Merrill, to arrive at some definite conclusion in connection with several schemes which the officers have in mind.

Secretary Merrill is hard at work on the through passenger tariffs for the roads out of Indianapolis, Dayton and Toledo, and has secured the approval of all the companies interested in the first tariff. A meeting of the various roads will be called within the next week to inaugurate the tariff and to decide definitely upon a few minor details of handling it.

Mr. Merrill has just returned from a trip calling on some of the roads in the vicinity of Cincinnati and Southern Ohio to interest them in the sale of inter-line tickets and the adoption of the interchangeable coupon books. The fact that the majority of interurbans entering Cincinnati operate only to the outskirts of the city and transfer passengers to city cars, is appreciated to be a great drawback to the sale of through inter-line tickets, but it is believed that in spite of this, these roads will be induced to participate; in fact, one road is already in the interchangeable agreement. The secretary is preparing to issue a fine folder map of all the roads in the association, and this and other advertising matter calling attention to the work of the organization will doubtless have the effect of lining up the few roads in the district not already members.

PLEASANT OUTING AT MONROE PIERS

Following a custom established two years ago by Mathew Slush, then president of the Detroit, Monroe & Toledo Short Line, the officials of the Detroit United Railway, which now owns the Short Line, recently entertained representatives of connecting lines, newspaper men of Southern Michigan and Northwestern Ohio, and hotel men of a number of cities on the various lines, at Monroe Piers, the beautiful resort operated by the Short Line. Special cars were operated over the Western Ohio, Toledo, Bowling Green & Southern, Lake Erie, Bowling Green & Napoleon, the Toledo & Indiana, Toledo & Western and Detroit United lines. Guests to the number of eighty had a fine time during the few hours passed at the Piers. The entertainment features included a trip on the lake in a launch, a spin on the figure eight, a dip in the fine bathing beach, and finally a dinner at the Lotus Hotel. R. G. De Lisle, traveling passenger agent of the Short Line, had charge of all arrangements. An interesting announcement was made by John H. Frey, assistant general passenger agent of the Detroit United, to the effect that beginning this week the company would operate through limited cars between Mt. Clemens, Mich., and Toledo, passing through Detroit. It was intimated that this was a preliminary step to the operation of through cars from Cleveland to Port Huron, Mich., forming the longest interurban service in the world.

Irwin Fullerton, auditor of the Detroit United, gave some interesting data regarding that system. He said that the company now operates nearly 700 miles of road, and last year carried about 116,000,000 passengers. Brief addresses were made by F. D. Carpenter, general manager of the Western Ohio; Henry Bullen, general superintendent of the Short Line; President Williams, of the Lake Erie, Bowling Green & Napoleon; George B. Kerper, of the Toledo Urban & Interurban, and C. T. Chapman, general freight and passenger agent of the Toledo & Western.

Many improvements have been made at Monroe Piers during the past year, among them the erection of a fine Casino, an electric lighting plant and a number of amusement features. The management has eliminated the sale of all liquors, which has added greatly to the popularity of the resort as a pic-nic park. The management of the resort and hotel is in the hands of Alexander McFee, representing the Short Line Company.

A CHICAGO-NEW YORK ELECTRIC TRUNK LINE BEING PROMOTED

An electric trunk line between Chicago and New York, to be known as the Chicago-New York Electric Air Line, is being promoted by Chicago parties, with offices in the Monadnock Block, Chicago. In full page advertisements in the Sunday editions of several of the Chicago papers subscriptions for stock are being solicited. The advertisements give a general description of the prospective road, stating that it will be constructed on as nearly a straight line as is possible, and that it will be 160 miles shorter than any existing route between the two cities. It is proposed to operate trains drawn by electric locomotives, at a speed of 75 m. p. h., so that the run between the two terminal cities will be made in 10 hours.

The advertisement states that the profits the "road will make for its stockholders are almost beyond calculation."

Shares with par value of $100 are offered at $25. In addition to its value as stock each share will entitle the holder to $100 in passenger fare, or in the payment of freight charges on the completed road. It is estimated that the road will cost $150,000,000. At the offices of the company a representative of the STREET RAILWAY JOURNAL was told that the road would first be constructed from Chicago to Goshen, Ind. Quite a portion of the right of way had been negotiated for and construction work would begin in September.

MAP OF INTERURBAN RAILWAYS IN THE CENTRAL STATES

A blue-print map has recently been published by the Arnold Company, of Chicago, showing the interurban electric railways in Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa and Missouri, and in the territory contiguous to these States, such as Western Pennsylvania, Western West Virginia, Northern Kentucky, etc. The map shows lines in operation, under construction and proposed, and is drawn to a scale of 35 miles to an inch.

REPORT OF MONTREAL STREET RAILWAY BENEFIT ASSOCIATION

The report of the Montreal Street Railway Mutual Benefit Association for the year ended April 30, 1906, was submitted at the third annual meeting of the association, held June 18. The following is a summary of the relief work done during the past year as compared with the preceding year:

	1904-5	1905-6
Number of members disabled through sickness or injury	611	687
Number of visits made by physicians to disabled members	692	1,390
Number of consultations given by physicians to disabled members	4,026	7,885
Number of prescriptions issued	2,864	6,751
Amount paid for sickness and injury	$6,239.10	$8,706.70
Amount paid for medicine	783.73	1,826.86
Amount paid for pensions	nil	215.00
Amount paid for death and burial insurance	5,767.67	4,050.01

Since the formation of the association the following amounts have been distributed:

For sickness and injury	$17,995.75
For medicine	2,678.59
For pensions	215.00
For deaths and burials	9,817.68
For medical attendance	3,615.81
Total	$34,322.83

The committee of management of the association gratefully acknowledge the special Christmas donation of $3,000 received from the Montreal Street Railway Company, making the total contributions, etc., from the company, $13,461.23. This amount, together with the fees and dues received from the members, viz.: $10,757, and the proceeds of the picnic and interest on investments and bank deposits amounting to $6,482.14, making a total revenue for the year of $30,700.37. The expenses being $21,705.29, there was left a surplus of $8,995.08.

ANNOUNCEMENT BY INDIANA, COLUMBUS & EASTERN COMPANY

W. Kesley Schoepf, of Cincinnati, head of the syndicate which has recently consolidated a number of Ohio roads under the name of the Indiana, Columbus & Eastern Traction Company, has made an interesting announcement as to the financing and plans of the big company. The company is a holding corporation, operating a system which, as has already been outlined in these columns, has a total capitalization of $24,000,000, one-half of which is bonds and the other half consisting of $1,000,000 preferred stock and $11,000,000 common stock.

The flotation of the securities of the company will be carried out in nearly every large city in the country. Drexel & Company, of Philadelphia, and Rollins & Sons, of New York, have taken a contract to float about one-half of the $12,000,000 bond issue, and have issued a prospectus offering these bonds at 97 and interest. The offer declares that $4,900,000 of the bonds will be sold at these figures, the issue being termed a general and refunding mortgage drawing 5 per cent interest and payable May 1, 1926.

In a letter to prospective bond buyers, Mr. Schoepf analyzes the financial report thus: Total bond issue, $12,000,000; reserved for retiring underlying bonds (of which sufficient amount are already held to reduce the amount to $1,250,000), $2,908,000. To be issued for acquisition of and extensions of lines, power plants, terminals and other improvements, $4,992,000; balance for additional betterments and further extensions, $4,100,000.

The first item of $2,908,000 is set aside to take up the bonds of the Appleyard lines, which are still in the hands of a receiver, and until final payments are made the ownership will continue to remain vested in the old bondholders.

The second issue of $4,992,000 for extensions and acquisitions of lines is the one now to be marketed, minus $82,000, which will go to floating the issue. The last item of $4,100,000 is to cover future operations and improvements, and the same will not be issued until the company has shown its ability to earn one and one-half times the interest charges on all outstanding bonds and those to be issued.

Speaking of further extensions, Mr. Schoepf says that provision has been made for the construction of the line from Lima to Bellefontaine and for the electrification of the steam road from Lima to Defiance; and also for the expenditure of about $1,000,000 for the improvement of roadbed and terminal facilities. It is the intention to erect as soon as possible well-equipped terminal stations in Dayton, Springfield and Columbus, giving facilities equal to the Indianapolis terminal station.

Mr. Schoepf comments further as follows: "The concentration of ownership of these various Ohio lines insures the greatest economy both in operation and construction. The result is an electric transportation system, in grades, alignment, right of way and construction of the same high standard established by steam roads. The company, however, is not competitive to steam roads, nor does it propose to attempt to handle heavy freight or through matter, but only express matter, the distribution for department stores, produce, milk and other light freight for which it is particularly equipped."

THE DATES OF THE ACCOUNTANTS' CONVENTION

The dates of the accountants' convention at Columbus have been set by the executive committee of the association. They are the morning and afternoon of Tuesday, Oct. 16, the afternoon of Wednesday, Oct. 17, and the morning and afternoon of Thursday, Oct. 18.

AN IMPORTANT IOWA DECISION

The Supreme Court of Iowa has handed down a decision of considerable importance, relative to the assessment and taxation of street railway and interurban railway property. It holds that where street railways and interurbans are owned by the same corporation and operated jointly the whole property of the company must be assessed by the Executive Council as an interurban railway. The case in which the opinion is delivered is that of the Waterloo & Cedar Falls Rapid Transit Company appellant vs. Board of Supervisors of Black Hawk County. The Executive Council of Iowa assessed the interurban and street railway properties of this company as an interurban property, and so certified the assessment to the county authorities of Black Hawk County. The company sought to enjoin the Board of Supervisors from collecting taxes on the assessment, asserting that the city railway portion of their property should be assessed by the city assessor. The Board of Supervisors filed a demurrer, and this demurrer was sustained by the District Court of Black Hawk County. The company appealed to the Supreme Court, and the Supreme Court now upholds the decision of the lower court.

JAPANESE RAILWAY PROJECTS

Another scheme is on foot to construct an electric railway between Osaka and Nara, with a capital of about $1,000,000. It is anticipated that electric railways will be running parallel with all the principal railway lines in the course of a few years.

The Minomo-Arima Electric Railway Company, capital $2,500,000, has been formed to build a double-track line between Osaka and Ikeda and on to Mina, the maple resort, and Arima. Other new projects are from Takarazuka to Mikage via Nishinomiya, and also from Iguchido to Ikeda.

A general meeting of the Hankaku Railway Company has decided to raise a loan of $1,500,000 from a Japanese capitalist for the extension of the shipping business, etc., of the company. The net profit for the period just closed amounted to $36,000, and after providing for the reserve, etc., a dividend at the rate of 3.2 per cent per annum was declared.

A general meeting of the Sanyo Railway Company adopted a proposal to present $10,000 to Mr. Matsumoto, late president of the company, in recognition of his services. A proposal to construct 140 open steel goods trucks to carry 9 tons each, ten open steel goods trucks with conductor's compartments, also to carry 9 tons, and ten 7-ton goods brake vans, at the estimated cost of $102,000, was also agreed to. The net profit for the period just closed has been declared at $1,244,800.

ALLIS-CHALMERS COMPANY AND THE MANUFACTURE OF CHRISTENSEN AIR BRAKES

Since the announcement, made some weeks ago, of the acquisition of rights to build and sell Christensen air brakes, the Allis-Chalmers Company has been busily organizing its new department for the extensive manufacture of this well-known device, which was formerly manufactured and sold by the Christensen Engineering Company and later by the National Electric Company.

J. H. Denton, who was general superintendent of the National Brake & Electric Company, has been engaged to act as manager of the new air brake department, and he will be surrounded by a staff of men who have been especially trained in this branch of manufacture. Shop facilities are being provided as rapidly as possible, and it is expected that shipments may be made from stock within seventy-five days from date. The entire second floor of the north shop, Reliance Works, Milwaukee, now occupied by the company's general offices, will be devoted to the manufacturing and assembling of air brake equipments, following the removal of the offices to the West Allis Works.

The following men, all of whom are thoroughly conversant with air brake practice, are now associated with the Allis-Chalmers organization:

F. C. Randall, formerly vice-president and general manager of the National Electric Company, for the past year has been manager of the New York district office of the Allis-Chalmers Company, and, owing to his intimate acquaintance with the manufacture and application of air brakes, is exceptionally well qualified to advise with traction men on this subject; W. W. Power, formerly manager of the National Brake & Electric Company's Philadelphia office, was recently appointed manager of the Philadelphia district office of the Allis-Chalmers Company; Geo. C. Voigt, formerly of the National Electric Company, has lately identified himself with the Allis-Chalmers Company, and will have charge of air brake sales in Western territory, and George C. Dresser, until recently with the National Brake & Electric Company, is to be attached to the Allis-Chalmers Company's New York office, as a special representative of the air brake department.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JULY 10, 1906

825,289. Safety Apparatus; John Barberie, Brooklyn, N. Y. App. filed Feb. 26, 1906. When the semaphore is set at danger, a trip is simultaneously operatively set in the roadbed, so that in case the engineer disregards the danger signal the trip will engage means on the train by which the air brakes are automatically set.

825,295. Combined System or Transport by Monorail and Auto-Car; Raymond Snyers, Brussels, Belgium. App. filed April 6, 1905. A frame carrying two revoluble monorail-wheels, a hollow shaft extending across the frame between the monorail-wheels, an arm or lever mounted upon each end of the hollow shaft, a road-wheel revoluble supported at the end of the arm or lever, and a torsion spring secured within the hollow shaft.

825,298. Electric Car Heater; Harold W. Buck, Niagara Falls, N. Y. App. filed Dec. 8, 1900. An air pipe conducts the heat generated in the motor windings into the car, a supply of fresh air being constantly supplied to the motor casing.

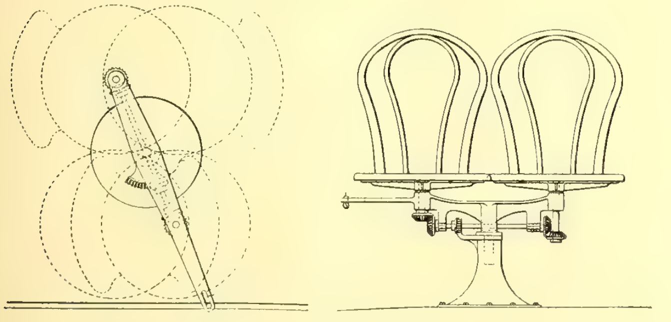
825,299. Support and Hanger; Joseph T. Bunn, Washington, D. C. App. filed Jan. 19, 1905. The hanger is suspended at the end of a long shank or standard, secured by suitable guy wires, the object being to provide a hanger for trolley wires whose guy wires will not interfere with any guards or guiding fingers mounted upon passing trolleys.

825,318. Block Signal System; Laurence A. Hawkins, Schenectady, N. Y. App. filed Jan. 25, 1905. A three-position semaphore is motor operated, and magnet-operated detents controls the position at which the semaphore is set.

825,366. Track Laying Machine; Charles O. Wescott, Puyallup, Wash. App. filed April 9, 1906. Relates especially to mechanism for unloading the rails from the forward car of the construction train and placing them into position on the ties.

825,396. Electrically Controlled Railway Switch; Frederick T. Kitt, Denver Col. App. filed July 18, 1904. A track switch whose point is thrown to alternate positions by successive closures of a single circuit. A solenoid armature has a pin dropping into a crown-shaped cam, so as to step the solenoid around at each actuation.

825,431. Pleasure Railway; La Marcus A. Thompson, New York, N. Y. App. filed Aug. 8, 1905. Comprises a building provided with a front wall, a portion of which is arched to form an opening, pairs of inclined ways extending from opposite sides of the opening, the upper portions of said ways being beyond the opening and the lower portion within the opening.



PATENT NO. 825,736

825,501. Trolley Wheel; Charles F. Wilson, New York, N. Y. App. filed Jan. 17, 1905. The wheel has sheet metal flanges, which are riveted to the central portion of the wheel and which constitute the tread thereof.

825,538. Inductive Bond; Lemuel F. Howard, Edgewood, and Philip B. Rice, Wilkinsburg, Pa. App. filed March 2, 1906. An inductive bond comprising a conductor having parallel portions, a laminated magnetic covering for said parallel conductor, the laminated magnetic covering along the parallel portions being common to both portions.

825,611. Railway Car; Allen E. Ostrander, Paterson, N. J. App. filed Nov. 4, 1905. Details of construction of a car having bulged or convex sides to conform to the inner contour of a tube or tunnel, the invention relating particularly to means for bracing the sides of the car.

825,668. Car Fender; Richardson C. Layton, Brooklyn, N. Y. App. filed Jan. 8, 1906. Details of construction.

825,678. Rail Cleaning and Roughing Device; David Price, McKeesport, and Harrison C. Zimmerman, Duquesne, Pa. App. filed Jan. 22, 1906. A track cleaner or rougher, composed of a plurality of cutting discs, each separately rotatable on a common axle and arranged eccentrically one to the other.

825,682. Removable Cross-Over; Clarence B. Ryan, Pittsburg, Pa. App. filed April 2, 1906. Comprises a plurality of frames carrying rails, and portable track sections supported by the frames.

825,724. Railway Car Brake; Pearl P. Hatcher, St. Louis, Mo. App. filed March 8, 1906. A track brake comprising a vertically reciprocating spring-controlled plunger, having a brake-shoe at the lower end thereof, superposed over the rail, an air-brake cylinder having a reciprocating piston, a spindle carried transversely by the plunger, a vertically oscillating lever having a forked end riding over the ends of the spindle, and intermediate connections for oscillating the engaging arm of the lever downwardly, and depressing the plunger and its shoe upon a movement of the air-brake piston in one direction.

825,734. Switch Operated Signal Light; George W. Jordan, Purvis, Miss. App. filed Sept. 26, 1905. A pair of spring blades are held in proximity to the rails so as to be pressed into engagement with one another by the wheel flanges of a passing train.

825,736. Car Seat; John B. Kilburn and Albert N. McConnell, Philadelphia, Pa. A pedestal having a beam pivoted thereon and revoluble chairs pivoted upon the beam, a rotary shaft and gearing intermediate of the shaft, chairs and pedestal.

825,740. Derailer; Thomas W. Linn and John H. Patrick, Clymers, Ind. App. filed March 19, 1906. The derailer is permanently mounted in a suitable casing at any desirable point, the invention relating particularly to means for cutting away ice and dirt that may have accumulated when it is desired to slide the derailing member into operative position.

825,781. Trolley; John H. Walker, Lexington, Ky. App. filed Sept. 9, 1905. The trolley harp is provided with upper and lower prongs, and the conduit leads extend alongside the upper prongs, and are braced against upward movement by said upper prongs and against downward movement by the lower prongs.

825,816. Car Seat; Francis K. Fassett, St. Louis, Mo. App. filed Jan. 11, 1904. Details of construction of a seat of the "walk-over" type.

825,834. Means for Controlling the Spread of Wheels of Railway or Tramway Vehicles; James C. Hinton, Arncliffe, New South Wales, Australia. App. filed Sept. 20, 1904. The axles are adjustable laterally in order to adapt the car for different gages of track.

825,847. Electric Car Signal Circuit; William Lintern, Cleveland, Ohio. App. filed Aug. 22, 1905. An accumulator battery on the car into circuit with which the tail lamps are automatically cut in case of failure of the power circuit.

825,871. Fender; William S. E. Sevey, New Orleans, La. App. filed May 5, 1906. A hinged fender adapted to normally rest in a raised position against the dashboard, and which can be expeditiously lowered when necessity demands.

PERSONAL MENTION

MR. B. L. PEER, of Rochester, has been appointed advertising agent for the Rochester & Eastern Rapid Railway Company.

MR. J. WHYTE EVANS has resigned as president of the United Railways Company, of Portland, Ore. He is succeeded by M. H. St. John Dix.

MR. G. H. RETTEW has resigned as superintendent of the Greenville Traction Company, the Paris Mountain Water Company, and the Greenville Gas & Electric Power Company, all of which are controlled by the American Pipe Company, of Philadelphia.

MR. ANDREW N. CULVER, who built the first steam railroad to Coney Island, over which the Brooklyn Rapid Transit Company now operates by electricity, and who was mainly instrumental in building up that resort, died Tuesday, July 10. He was 74 years old.

MR. WILLIAM M. MARINAN, for twelve years in the employ of the Elmira Water, Light & Railroad Company, of Elmira, N. Y., has resigned from the company to become general superintendent of the Dunkirk, Fredonia & Brockton Electric Light, Gas & Street Railway Company.

MR. ALFRED BEIT, of Wernher, Beit & Company, of London, England, died on Monday, July 16. Mr. Beit was largely interested in mining operations in South Africa and elsewhere and as a member of Wernher, Beit & Company also was interested in

street railway systems in Portugal and South Africa. Until recently he was one of the principal owners of the Mexico City Tramway Company, Mexico City, Mex.

MR. A. R. DIMICK, formerly chief despatcher for the Oregon Water Power & Railway Company, has been appointed assistant superintendent to succeed Mr. G. F. Boynton, who resigned to become claim agent for the traction lines owned by the Portland Railway, Light & Power Company.

MR. JOS. A. LOCKHART, assistant superintendent of the New York & Fall River Street Railway, has resigned to become connected with Stone & Webster, of Boston. Mr. Lockhart's successor with the Newport & Fall River Company is Mr. George L. Southerland, a conductor on the Newport division.

MR. GEORGE W. BOTHAM has resigned as superintendent of the Dayton & Western Traction Company, to go with the Northern Electrical Manufacturing Company, of Madison, Wis., with which company he was identified before going into the operating end of the traction business. His resignation took effect July 12.

MR. W. B. GRAHAM, superintendent of the Paterson division of the Public Service Corporation, has been made superintendent of the Newark district. Superintendent Strong, of the Jersey City district, will take Mr. Graham's place at Paterson. Mr. Graham formerly was superintendent of surface lines of the Brooklyn Rapid Transit Company.

MR. J. D. DEWEES, of Salem, Ohio, an experienced steam road man, has been appointed traffic manager of the new Youngstown & Ohio River Railway, and Mr. Wilson V. Myers, also of Salem, has been appointed auditor of the company. Both officials will have their offices in Salem. The line will be placed in operation between Youngstown and Salem this fall.

MR. P. L. FOCARDI, electrical and mechanical engineer, has resigned his position with J. G. White & Company, with whom he has been for a year and a half, to return to the New Jersey Foundry & Machine Company, of New York City. Mr. Focardi is a son of the late Mr. G. Focardi, the sculptor of popular groups, and is a graduate of Columbia University in the class of 1901.

MR. ALSON C. RALPH, of Boston, Mass., who has been with the Thomson-Houston and General Electric Companies almost continuously since January, 1891, as erecting engineer and expert electrician, has severed his connection with the General Electric Company, and accepted a position with Stone & Webster, of Boston, as superintendent in charge of construction and development work, and is now in El Paso, Tex., superintending the work of installing new apparatus at the El Paso power plant.

MR. E. V. McGRATH, of Findlay, has been appointed soliciting passenger and freight agent of the Dayton, Springfield & Urbana and the Urbana, Bellefontaine & Northern divisions of the Indiana, Columbus & Eastern with headquarters at Springfield, Ohio. He was formerly traveling passenger agent for the Cincinnati, Hamilton & Dayton (steam), and was under Mr. D. J. Edwards, who has become traffic manager of the Schoepf line, and to whom he will again report.

MR. FRANK C. SYKES, assistant engineer of maintenance of way of the United Railroads, under Engineer Warren C. Lane, has tendered his resignation to take effect at the end of June. Mr. Sykes is widely known in San Francisco and has been with the company and its predecessor, the Market Street Railway Company, for many years, having been an assistant to Mr. Henry H. Lynch, when the latter was at the head of the engineering department of the company.

MR. JAMES F. HEYWARD, who was formerly general manager of the City & Suburban Railway Company, of Baltimore, has been appointed to assist Mr. W. Kesley Schoepf in the management of the systems in Ohio which have recently come under control of Mr. Schoepf and his associates. The work delegated to Mr. Heyward is the management of the Cincinnati Traction Company, including one of the interurban lines. Mr. Heyward for the last eight years has been acting as a street railway expert with offices in New York.

COL. E. C. SPRING, president of the Central Electric Railway Association, acted as host on Friday, June 29, at a luncheon given to the members of the executive committee of the association at the Country Club in West Milton, Ohio. The table was tastefully decorated with flowers and bore covers for nine persons. The center piece was a floral monogram of the letters "D. C. & P.," the initials being those of the Dayton, Covington & Piqua Traction Company, of which Mr. Spring is manager. Following the lunch the guests were taken on a trip through the city of West Milton in a big 12-seat automobile.

MR. H. F. BALL, superintendent of motive power of the Lake Shore & Michigan Southern Railway, has resigned to become a vice-president of the American Locomotive Company, in charge of a branch of the company which is devoted to automobile work. It is understood that the company will engage extensively in the manufacture of gasoline railway cars as well as automobiles. Mr. Ball has taken an active interest in the experiments which the Lake Shore has been making with gasoline cars. He went to the Lake Shore about fourteen years ago, and was employed as a draughtsman. He succeeds Mr. W. H. Marshall, who, some time ago, was called to the presidency of the American company.

MR. G. C. PIERCE, formerly purchasing agent of the Hudson Companies, of New York, has just been appointed general superintendent of the East St. Louis & Suburban Railway Company. Mr. Pierce was one of the pioneers in the electric railway business, and had charge of the interests of the Westinghouse Company on the Pacific Coast for several years. Later he went to Mexico, where he spent three and one-half years in power development in connection with the San Ildefoso Light & Power Company, now a part of the Mexican Light & Power Company, of Mexico, and with the Mexican Traction Company, now a part of the Federal District Railway Company, of the City of Mexico.

MR. WILLIAM H. OWENS has been appointed general manager of the electric light and power utilities of Granite City, Venice and Madison, to take office at once. He has been in charge of the Edwardsville light and power plant since Feb. 10 last. These properties are owned by the McKinley syndicate, which operates municipal utilities and interurban and city lines in Illinois. Mr. Owens, who is only 25 years old, was graduated from the University of Illinois in 1902, and secured a place as clerk in the Danville office, going thence to Champaign, Springfield and Edwardsville, with successive promotions to the posts of assistant cashier, cashier and auditor. Then he was appointed manager of the Edwardsville properties, and now takes charge of those of the Tri-Cities. Mr. D. Bell will be assistant superintendent of the Venice plant.

MR. ELMER E. COOK has just resigned his position as general manager of the rolling stock and traction department of the Brush Electrical Engineering Company, of London, and has returned to this country to take up his residence here. Mr. Cook was formerly connected with the McGuire Manufacturing Company, of Chicago, with which he was associated for the nine years preceding 1900, when he went to England. The Brush Electrical Engineering Company is one of the large manufacturers of tramway rolling stock in England, and while connected with it Mr. Cook designed rolling stock of all descriptions and had charge of the organization of the staff of the selling and traction departments. While engaged in this work Mr. Cook designed several types of all-steel cars which his company built for the Yerkes and Great Northern & City Underground lines, and for the London, Brighton & South Coast Railway, also a steel tramway car for the subway route of the London County Council. Mr. Cook has also designed a radial truck for street railway cars, which has attracted considerable attention in England.

MR. CHARLES RUFUS HARTE, until lately in charge of the New Haven improvement of the New York, New Haven & Hartford Railroad, at New Haven, Conn., has been assigned to the construction work of the Consolidated Railway, the electric holding corporation of the New York, New Haven & Hartford Railroad. Mr. Harte will have charge of all new construction, with headquarters at New Haven. Born at Marietta, Ohio, in 1870, Mr. Harte received the degree of C. E. from Columbia School of Mines, New York, in 1893, and, entering the construction department of the New Haven Road, has held positions of increasing responsibility on four-tracking the New York division, New Haven to Housatonic River; Forest Hills elevation in Boston; four-track connection, Back Bay station to terminal, Boston; and double-tracking the Naugatuck division. Resigning in 1901 to go with Stone & Webster, of Boston, Mr. Harte located and started construction on the interurban electric railway from Sydney to Place Bay, Cape Breton, Nova Scotia, and the Clinton extension of the Terre Haute Electric Company, Terre Haute, Ind. In 1904, Mr. Harte was recalled to the steam road to take charge of the very extensive four-tracking improvements at New Haven, preparing the plans and representing the engineering department in the extended discussion with the city of New Haven which followed, and working out the details of the scheme finally adopted. Shortly after work began, several large construction jobs were merged under one head, Mr. Harte remaining as assistant in charge of the New Haven work until his recent transfer and promotion.

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Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 237,100 copies, an average of 8175 copies per week.

Concerning Time Standards

The practice of requiring motormen and conductors to compare watches with a standard clock located at some prominent point on their route is constantly growing in favor among operating companies that take a broad view of their responsibilities. No argument is needed to prove the importance of a time standard on either a street or interurban railway; it is a self-evident proposition that schedules can not be maintained properly unless such a standard is provided in one or more places accessible to every employee of the operating department. It is by no means necessary that every road should buy Western Union Observatory service for every point on its system where a clock is needed, although it is frequently the case on large systems that standard time is purchased in this way for all the car houses, power plants, shops and executive offices.

The main point about the time problem is to see that whatever clocks are maintained are first of all in mutual agreement; and second, that they are correct in comparison with the standard time clocks of the community served. A few days ago we noted a difference of five minutes on the late side between a large illuminated electric clock located conspicuously on the front of the principal offices and shops of a city street railway system of nearly 150 miles trackage and the standard time clocks of the town. Such a large error as this opens the door to no little confusion among motormen and conductors who pass the clock, introduces great possibilities of accident on single-track lines, and tends to create a feeling in the operating department—by no means always justified—that the management is inclined to be slip-shod. The public is also inconvenienced if cars are run on inaccurate time, particularly in the matter of meeting appointments and connecting with railroad trains. Few persons realize the chain of disastrous consequences which the loss of two or three minutes often entails in matters of great personal moment. It is better to rely on some one large public clock than to maintain an inaccurate standard. On a steam railroad, accurate time is an absolute necessity; on many interurban and city lines it is scarcely less so, considering the vast number of people concerned. If a standard clock goes wrong it is better to cover the dial until repairs can be made than to permit its false indications to be accepted as a basis of operation.

Armature Bearing Sizes

Two methods of fitting armature bearings to shafts are in common use by electric railway companies. One method is to keep in stock only the rough babbited bearings and have a machinist turn out these bearings to fit whatever armature journal is to be run in them. This involves the calipering of each armature journal at the time the bearings are renewed and a certain amount of special work on every armature bearing that is turned. While this method insures accurate fit if the machinist is skilful and careful, it does not permit of the rapid production of bored armature bearings, as each is a special case by itself. The other method in common use is to maintain two or three standard sizes of armature journals and bore out armature bearings to fit these two or three sizes, designating them as sizes A, B, C, etc. These various sizes are kept in stock, so that they can be taken out at any time

to fit on corresponding journals. The advantage of this system is that armature bearings can be bored out in large quantities with boring tools set permanently for certain sizes of bearings. Thus the amount of special machine work is reduced to a minimum and the company always has armature bearings which can be obtained on short notice without waiting for a machinist to turn up the proper size. Where a system of this kind is in use the number of sizes of bearings required will depend somewhat upon the age of the motor equipments and amount of wear that has taken place on the oldest journals. For example, the new journals would be classed as size A. Size B would be one thirty-second or one sixty-fourth inch smaller, and size C a corresponding amount smaller than size B. When the motor journal has worn sufficiently to be too small for the third size of bearing, a sleeve is shrunk on the journal so as to bring it up to the size of the new journal, and it is again classed where it started. The latter plan is evidently best adapted to large companies, where it is desirable to perform operations on a large scale, and where there are enough motors with a given diameter of journal to make it feasible to carry a stock of various sizes.

Private Car Courtesy

The connecting up of many interurban links in the States of the Central West, making it possible to travel by electric lines between points several hundred miles apart, has been responsible for a great deal of interline special car tours. Many managers, for instance, in attending meetings of the Central Electric Railway Association, have taken parties long distances in their own cars. There have also been numerous trips of inspections and pleasure trips. Newspaper men and others whom roads have been desirous of favoring have been treated to long excursions, sometimes to open up pleasure resorts, or perhaps to be present at the inaugural of new extensions. As a rule, where these excursions have not been for profit it has been the practice of the managers of the roads visited to extend the courtesies of a pilot and the power consumed without making any charge for the services. Steam roads frequently haul private cars gratis for officials of other roads, and no very great expense is attached to the courtesy so long as it is not carried to excess.

The situation is rather different on electric roads, however. It is impossible, under present conditions at least, to attach the private or special car to a regular car, so that it must go over the road as a "special." Where it is sent over a road as a second section of some limited train and kept on the limited's time, no difficulty would occur, but where, as frequently occurs, the special is too slow to keep up with the limited, or where it is put into a schedule as an "extra" or "special," it frequently causes a great deal of confusion for the despatchers and trouble for the manager of the road. Both the manager and the despatcher usually make an effort to give the visitors a "good ride," and they attempt to put the car over the road as fast as possible. Those who are familiar with train despatching on interurban roads, however, appreciate that to run a special over a road at high speed and keep it out of the way of regular cars is no small task. The majority of the high-speed single-track interurban lines to-day are operating pretty close to what would be considered a dangerous headway on steam roads. We know of single-track lines operating half-hourly local cars, limited cars every two hours and four express runs a day, not to mention occasional work cars and line cars. This means in all a car over a given piece of single track every ten or twelve minutes, a frequency of train service which would appall the average operator of a steam road. Then, if in addition a special is put in with orders to give it a fast run, the result is apt to be very trying to the nerves of the most skilful train despatcher.

Therefore, if the man in charge of the visiting car appreciates the golden rule, he will not express a desire to break records, but he will arrange for a schedule which his car can reasonably make, and will stick to it if it is possible to do so. But if he does not do this, or if he shows up an hour or so after he had agreed to leave and does not attempt to carry out the schedule laid out for him, he imposes a burden of responsibility upon the train despatchers. Regular cars must be held up to allow the special to make sidings, cars are made late, with inconvenience to patrons of the road, and there is a general breaking up of schedule which may continue for hours after the special has left the road. Besides all, there is an added element of danger which may cost lives and destruction of property. Courtesy in matters of this kind should be considered when traction men go visiting in special cars.

How to Read This Paper

The electric railway field has grown so in extent that we no longer expect every subscriber to this paper will be interested in every article that is in it. Our subscription list comprises not only those actively engaged in the operating, mechanical, accounting and legal departments of city and interurban electric railways, but many other interests as well, such as designers and manufacturers of street railway apparatus, consulting engineers, bankers and individual stockholders of electric railway companies. During the last few years a great many steam railroad men who foresee the application of electricity to many of their own lines and who wish to become conversant with electric railway practice, have also been added to our subscription list. To cover each department in electric railway operation thoroughly we have therefore been obliged greatly to increase the size of the paper. Obviously we cannot publish articles relating to every department in every issue, but during at least every three months we aim to give as much space to each department as opportunity offers or as its importance compared with that of the rest of the field deserves.

As our readers have noticed, the arrangement of the articles in the paper follows a regular rule which should assist the reader in making such selections as he may desire. Thus the articles immediately following the editorials are usually devoted to a description of the construction or operating practice of some important company. These descriptions are followed by contributed or unsigned articles upon special branches of railway practice, and these by correspondence, when we are in receipt of letters for publication. Following these departments of the paper are descriptions of any new mechanical appliance or apparatus which has been brought out recently and which seems to the editors of sufficient novelty and value to warrant consideration in these pages. The matter in small type is devoted practically in its entirety to news of the week. This department commences with a report of the markets and other financial information. This is followed by accounts of other events

which are considered of more importance than those contained in the briefer news notes, which are classified alphabetically by States in the mixed advertising and reading pages in the back part of the paper. In the legal department, which appears once a month, the department editor discusses some important legal topic connected with street railway operation which is of present interest. This editorial is followed by the syllabi of decisions on street railway cases delivered by the courts of last resort in the several States. This department is always bound in between the technical and news sections of the paper.

Each reader must elect for himself which portion of the field he is most anxious to follow. These articles can be selected by himself, or, if he is too busy for that, they can be brought to his attention by some subordinate to whom he has given the necessary explanation. There is one suggestion, however, which we should like to make in this connection. The departments in electric railroading are so interconnected that no one actively engaged in the industry can safely confine his knowledge to any one or two of them. While he need not be a specialist in every branch of the business, he should know, at least in a general way, the progress being made in all of them, and this can best be accomplished by reading what is being done in other departments. A young man in an operating company, especially, cannot safely specialize in one branch of the service to the exclusion of other branches. If he has ambitions of a managerial character he must be acquainted with other portions of the work as well as that in which he is at the moment engaged. He will find that a wide knowledge of the business will not only broaden his views, but he will also be fitting himself to understand other street railway problems which may be brought up to him in the future, whether they are of a financial, accounting, engineering, legal or mechanical character.

The Subway Discussion

There have recently appeared in the transactions of the Rapid Transit Commission, as published in the "City Record," two more contributions to the somewhat acrimonious debate on the virtues and failings of the metropolitan Subway. One of these is from Mr. Sprague, dealing with the difficulties of maintaining the proposed schedule and virtually putting it up to the commission to say whether it approves the existing shortcomings. The other is a polite but forcible rejoinder by Mr. Stillwell, defending the decisions that have resulted in the present experiment. As in previous discussions along this line, the question hinges mainly upon the multiple-unit system. Mr. Sprague holds that much of the responsibility rests upon the failure to adopt this system in its entirety as he had advised, and Mr. Stillwell takes the position that changes in this system have been such that if the commission had adopted Mr. Sprague's system in 1900 it would have found it necessary to replace it *in toto* before now. This much is clear, that the existing equipment is not entirely satisfactory under existing conditions. But how far the situation would have been improved by taking up Mr. Sprague's system as it was laid out in 1900 is still on the face of the question somewhat uncertain. Probably no scheme arranged to meet the situation as it existed six years ago would have remained satisfactory up to the present time.

In view of other experience both here and abroad, it would be putting the case too strongly to say that a system in which all cars are motor cars is necessary to successful rapid transit. The gain in acceleration by such a course is theoretically obvious, yet the vital question as to whether the amount of acceleration safe and advisable in the New York Subway requires such practice has not been answered. As Mr. Stillwell pertinently remarks, the multiple-unit system is extremely complex. If an equally good result can be obtained without adopting it in full, the simpler way would be preferable, and it seems to us that the situation is so far complicated by conditions quite apart from the connections of the motors that a decision upon the facts is singularly difficult. In the general specifications quoted by Mr. Sprague there was one slip which seems to us to have led to serious results. This was the assumption of ten seconds as the normal duration of stops on the express service. Just how this figure was reached it is difficult to state, but it certainly has proved to be wide of the mark. In the first place, a very inadequate allowance was made for the number of people who wish to transfer between express trains and locals at express stations, with the result that the time required for stops has been greatly increased. This is independent of the general augmentation of traffic itself, which, as usual, was underestimated. If the express stops were actually ten seconds, instead of from forty-five to sixty seconds, as is now often the case during the rush hours, the schedule could be maintained much more easily than is now possible. Whatever the cause of the ten-second assumption, it was an incorrect starting point for working out an equipment for the Subway.

It is not impossible that this interval may have been derived from estimates where there was less congestion so that the crowds upon the platforms could circulate more easily. Or it may have been based on results obtained with types of car different from that finally adopted. The ideal car for rapid transit purposes would be one which could be discharged and loaded in the minimum time. Experience has shown that the early Subway cars with narrow platform doors were very far from this ideal, and the later modifications still leave much to be desired. Large door spaces and large platforms are absolutely necessary to rapid handling of passengers, and these are neither provided nor denied by variations in the motor equipment. Hence it seems to us that any tacit assumption which in comparing motor systems implies adequate facilities of entrance and exit is at fault. Let these be provided first, and then consider the residual difficulties. Another point to be considered is the effect of shortened headway and quickened service on congestion. That these elements tend intrinsically to improvement is doubtless true, but we question whether they produce as great results as might be expected. The task of a rapid transit system is not only to accommodate a given number of passengers daily, but to do it for the most part within a very limited space of time. If quick service is provided for the rush hours only there is a certain tendency to increase congestion at the very time when every effort is bent toward reducing it. The finer strategy of the subject has been little studied adequately. We are inclined to think, however, that minimum headway alone does not mean maximum efficiency. We shall have something further to say of the technical points raised in the Sprague-Stillwell controversy. It is merely intended here to point out some of its features upon which traffic conditions have a bearing.

COMMERCE STREET POWER PLANT OF THE MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY

About four years ago the Milwaukee Electric Railway and Light Company began the erection of the Commerce Street power plant, which supplies practically all of the current required to operate the extensive street and interurban railway system in and about Milwaukee. In many features, notably in the methods of handling the coal, of feeding the boilers, and of securing independence of the several units, the plant is distinctive and departs from the usual design of power plants of this size.

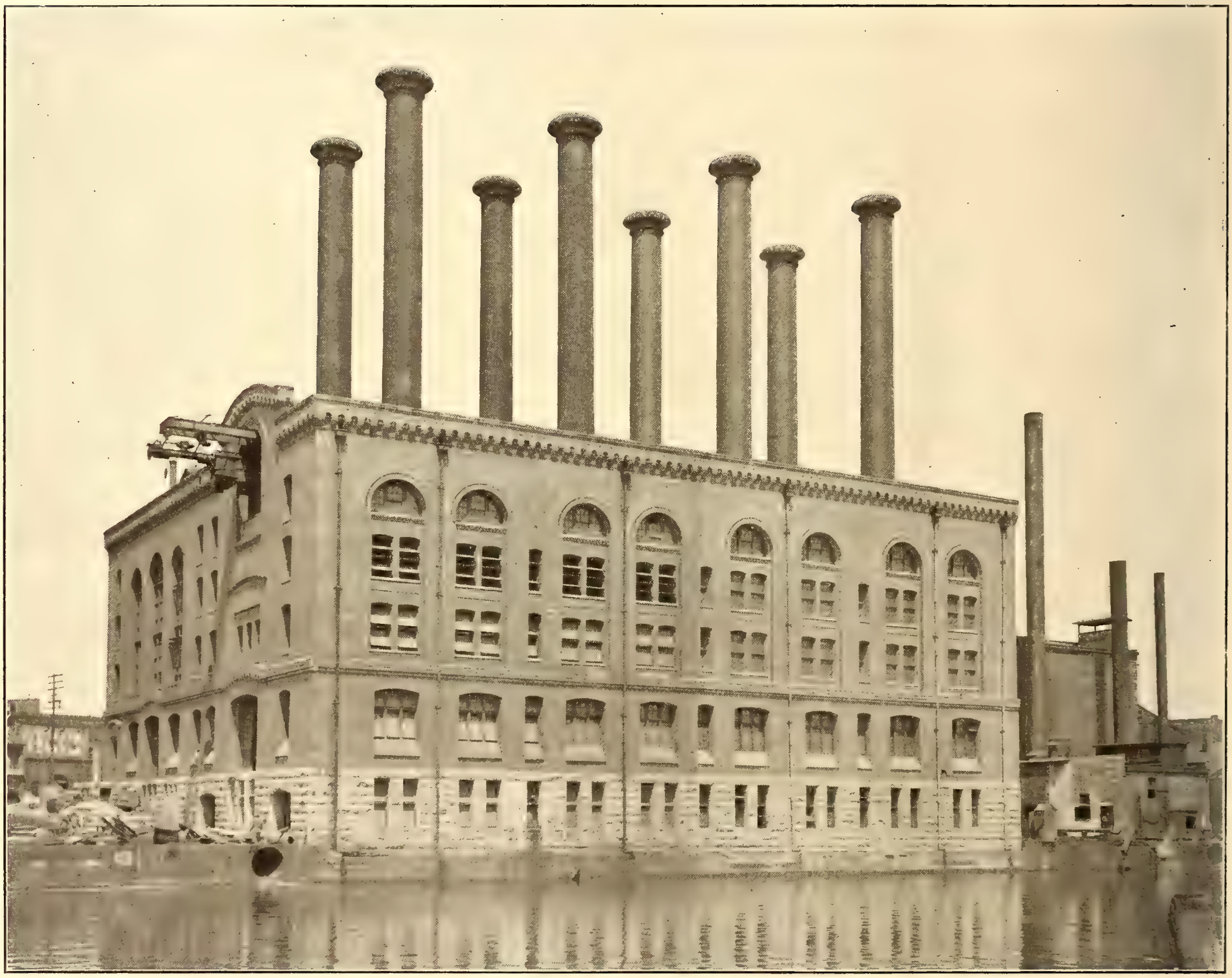
It was designed and constructed by the engineering department of the operating company under the general direction of John I. Beggs, president and general manager of the company. The erection of the generating plant as a whole was in charge of C. J. Davidson, chief engineer of the company, who now has charge of its operation, while the installation of the wiring and the switchboards was under the general supervision of O. M. Rau, chief electrician of the company.

GENERAL PRINCIPLES OF DESIGN

In designing the plant two ideas might be said to have predominated. These were that the machinery should be systematically grouped and placed as closely together as consistent with the convenient and economical operation of the plant and accessibility for inspection and repairs, and that the separate units should be so equipped as to secure independent operation in case of derangement of any of the apparatus.

Up to the switchboard the Commerce Street plant consists practically of eight separate plants installed in one building. In the alternating current portion of the plant the sectionalizing is carried still farther, that is, through the switchboard and out to the outgoing feeders and sub-stations. The manner of sectionalizing the several boiler and generating units and portions of the switchboard will be brought out in the description to follow.

Although construction was begun several years ago, the last unit, which is a 1000-kw Curtis steam turbine, has just been installed, and the general plan and total capacity has been increased from time to time as the requirements for current demanded. The southern half, which contains the alternating current generators, was erected and operated for about a year before construction work was begun on the latter portion, and later the Curtis turbines were installed. The generating units now consist of four 1500-kw a. c. generators driven by Allis-Chalmers cross-compound engines, four 2000-kw, 600-volt d. c. generators driven by Allis-Chalmers cross-compound engines, and two 1000-kw Curtis steam turbines, having a total of 16,000-kw rated capacity.



THE COMMERCE STREET POWER STATION AS SEEN FROM THE MILWAUKEE RIVER

LOCATION

The location of the plant at Commerce and Poplar Streets and the Milwaukee River is but a few blocks from the business center of the city, and was chosen mainly because of

its central location and the abundance of water easily obtained from the river. Railroad facilities are also favorable at this point. Power plants were installed in each of the two build-

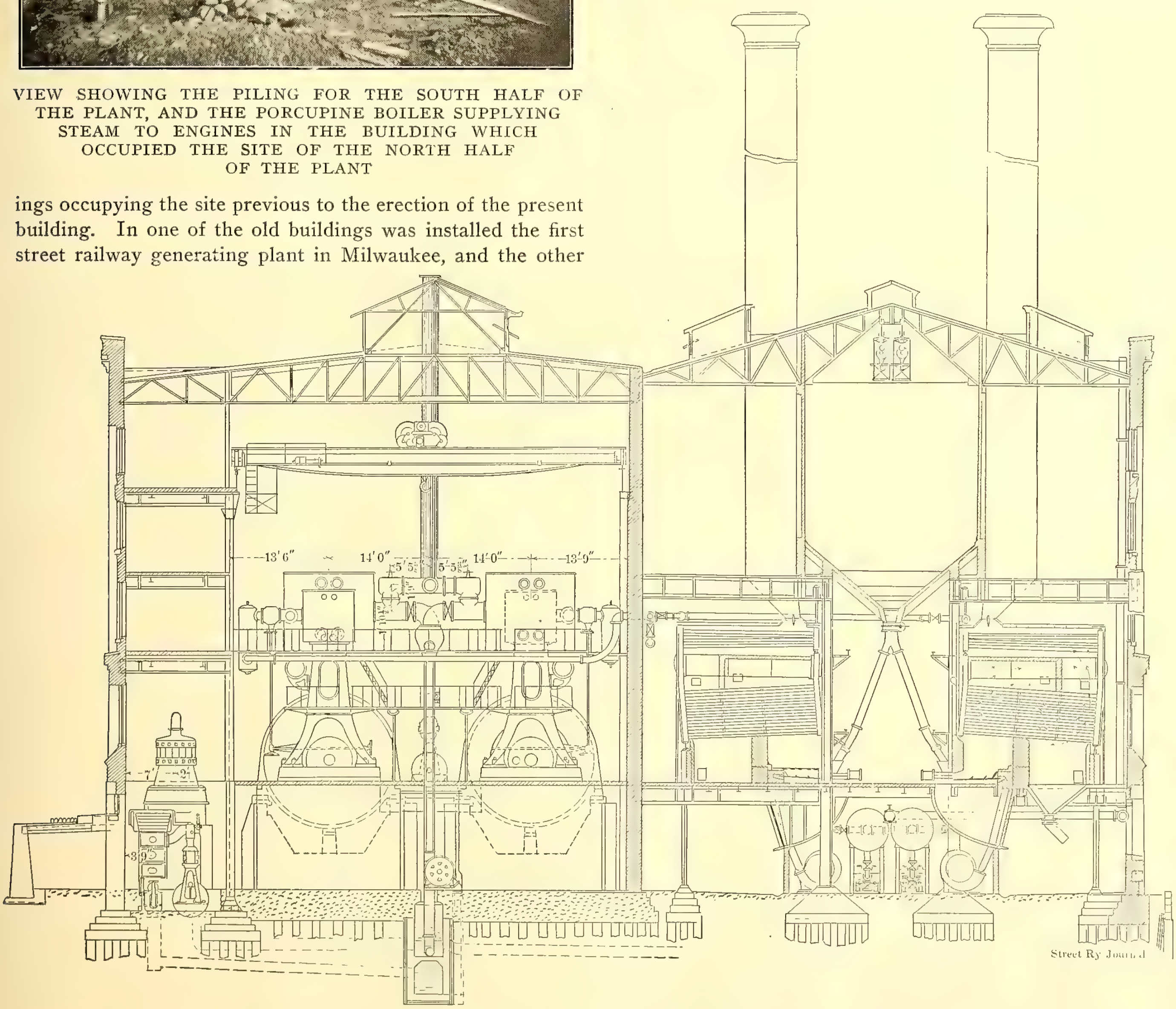
VIEW SHOWING THE PILING FOR THE SOUTH HALF OF THE PLANT, AND THE PORCUPINE BOILER SUPPLYING STEAM TO ENGINES IN THE BUILDING WHICH OCCUPIED THE SITE OF THE NORTH HALF OF THE PLANT

ings occupying the site previous to the erection of the present building. In one of the old buildings was installed the first street railway generating plant in Milwaukee, and the other contained the first Allis-Chalmers compound engine ever constructed. Difficulties of building the new plant were increased by reason of the fact that it was necessary to keep a portion of the old plant in operation during the construction of the new one. In fact, a vertical porcupine boiler of the old plant was kept in service until the installation of one of the boilers of the new plant. One of the illustrations shows this condition; the old boiler generating steam in the center of the building operations, and the steam piping from it carried over the work.

STRUCTURE

The building housing the present plant is a brick and steel structure resting on foundations of cut stone, which in turn is built on concrete capping over wood piles. The roof, which is comparatively flat, is liberally provided with ventilators and skylights, and is supported upon a steel framework. The whole structure measures 161 ft. 1 in. long by 143 ft. 6 ins. wide, and as the station has a capacity of 16,000 kw, it will be seen that, although reciprocating engines of comparatively small size have been installed, the floor space per kilowatt is only 1.43 sq ft.

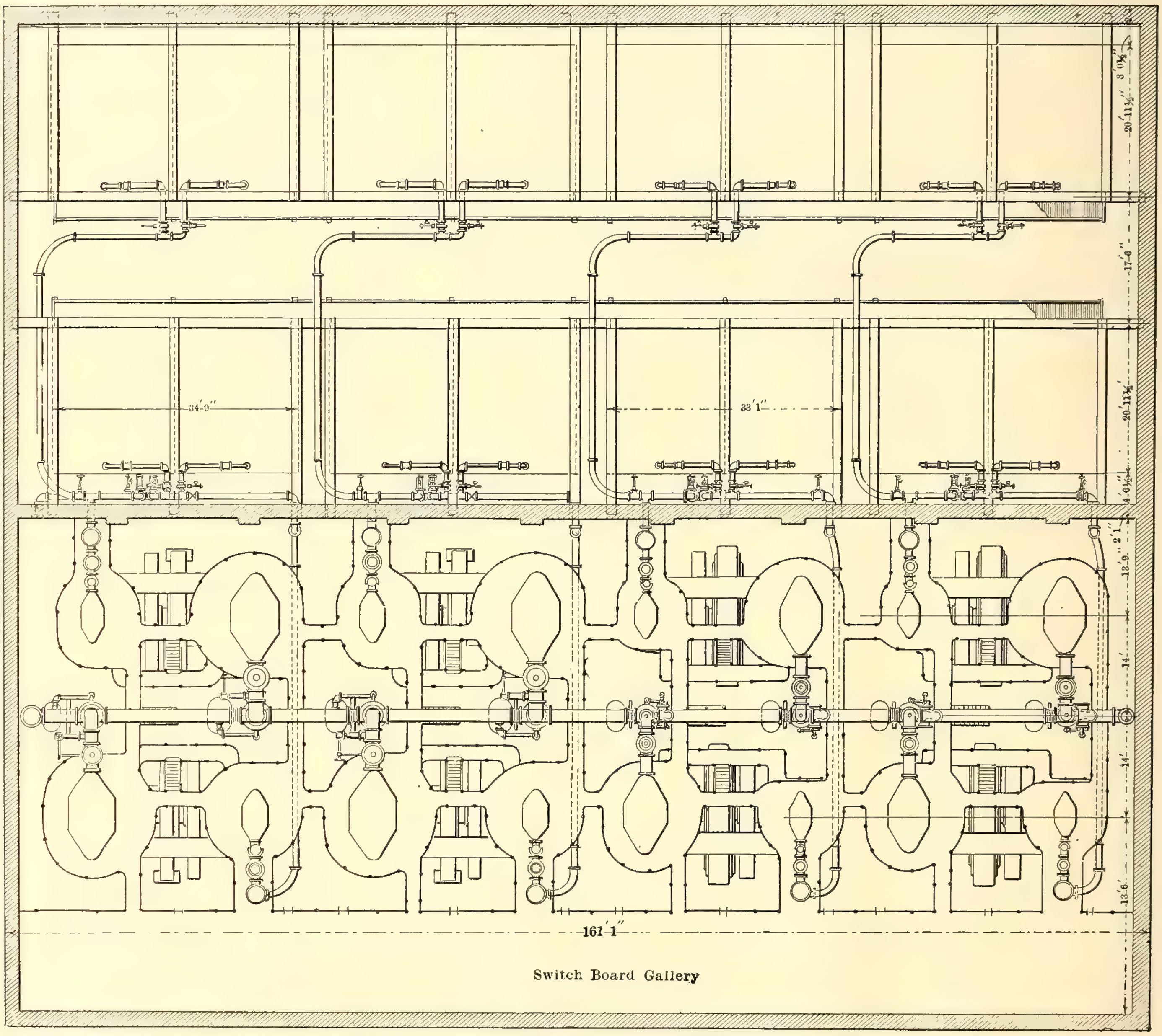
The building contains a boiler room and an operating room of about equal sizes, divided by a brick wall extending a few feet above the roof. The boiler room is on the east or river side of the wall. Underneath the main floor on which all the



CROSS SECTION OF NORTH EXTENSION OF COMMERCE STREET POWER PLANT

boilers are installed is a basement containing auxiliary apparatus, and above are the coal bunkers. A series of galleries along the west wall of the operating room, and served by an elevator, contains switchboards, office, machine shop, and storage space for supplies and repair parts. On the main

floor underneath the south end of these galleries are a motor-driven exciter and three motor-driven frequency changers, while the two Curtis turbines previously mentioned are located underneath the north end of the galleries. In the basement between the foundations of the two rows of generating units are the condenser pumps and other auxiliary machinery for the generating units. The high-tension buses, distant-control electrically operated oil switches and other high-tension apparatus are installed in the basement in an isolated compartment partly under the south end of the galleries and partly under the sidewalk. In the basement are also toilet rooms which contain shower baths and lockers and are finished in Tennessee marble.

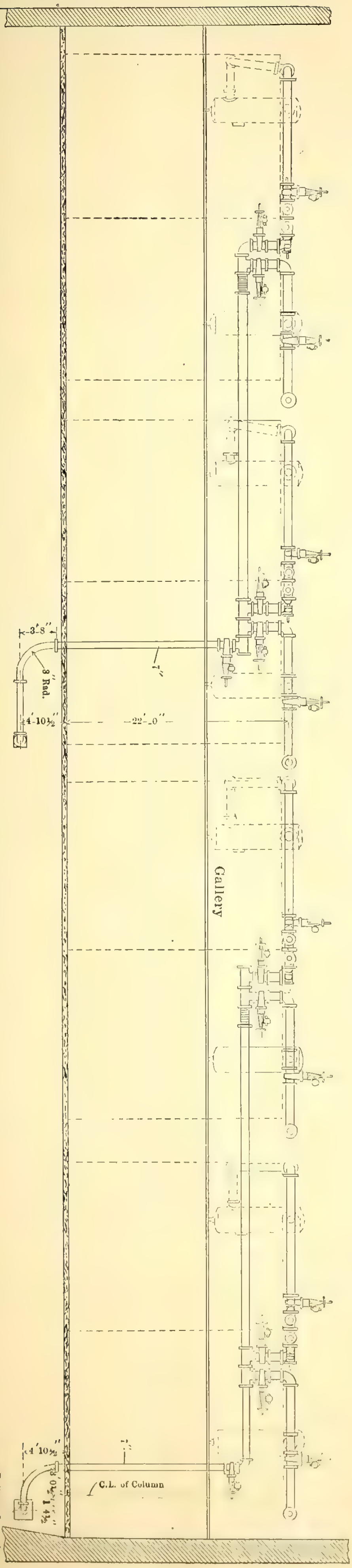


PLAN OF THE COMMERCE STREET POWER STATION, MILWAUKEE

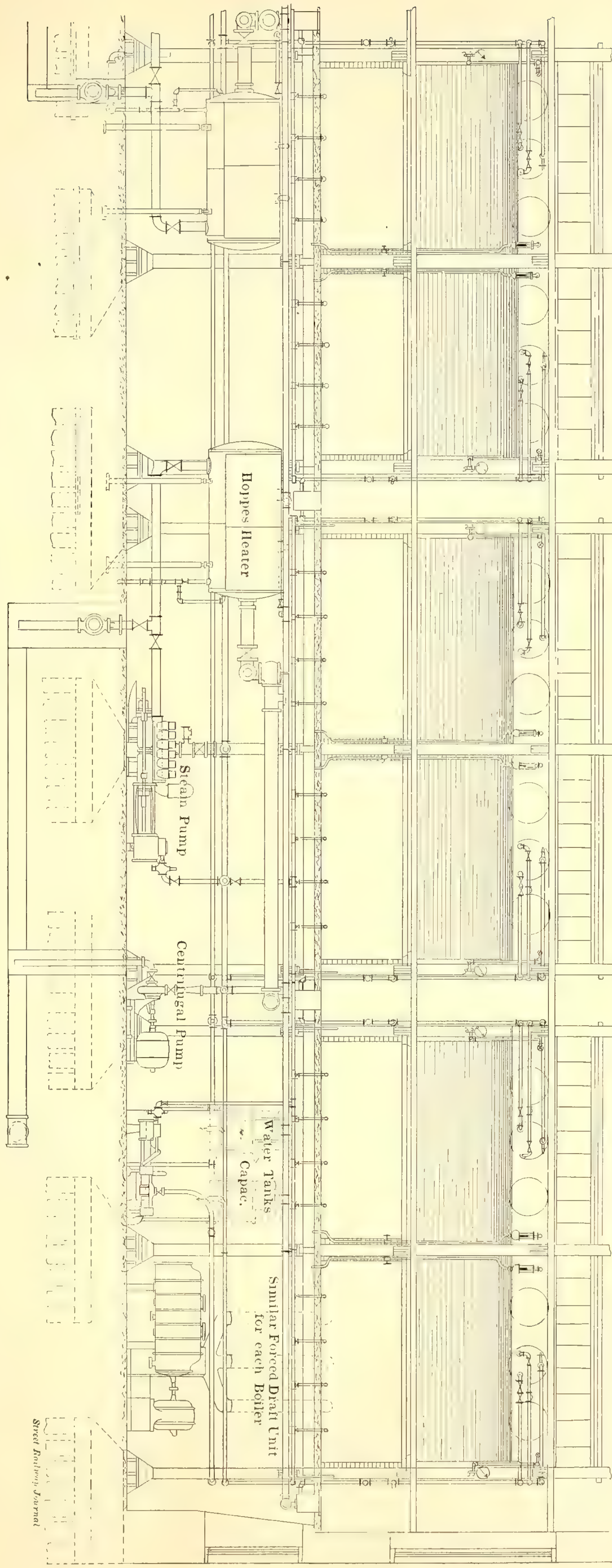
BOILER PLANT

The boiler plant consists of eight units, each made up of two Edgemoor boilers equipped with a stack and auxiliary apparatus independent of the other units and piped separately to one of the eight large generating units in the operating room. Each boiler is equipped with a Monitor injector, four Jones underfeed stokers, a Squires feed water regulator, and a motor-driven centrifugal fan for supplying pressure for forced draft. Those boilers in the older portion of the plant have 6500 sq. ft. of heating surface, while the remaining eight are somewhat larger, having 7000 sq. ft. No economizers are installed, but the boilers are provided with superheaters consisting of five rows of 4-in. tubes which give about 60 degrees of superheat to the steam. The boilers are operated at 160 lbs. pressure. The boiler steam gages, as well as all of the other steam and vacuum gages in the plant, are graduated from zero pressure absolute. This was done to eliminate the necessity of reducing pressures above the atmosphere to absolute pressures in working up indicator cards, as well as to avoid the necessity of referring to vacuum in speaking of condenser pressures. The space immediately above the boilers and on each side of the coal bunkers has been reserved for economizers, but with coal at its present price it has not been deemed advisable to install them.

The method of setting the boiler may be observed in the drawing of the cross-section of the station. The fan supplying forced draft, and which is driven by a 20-hp motor, is installed underneath the front portion of the boiler. The air supply is controlled by a Spencer damper regulator. Running the full length of the building under the rear of each



ELEVATION OF MAIN SYSTEM OF PIPING



LONGITUDINAL SECTION OF PART OF THE BOILER ROOM

line of boilers is a passageway built large enough to accommodate standard gage ash cars, but at present wagons are utilized to remove the ashes. The ashes drop down from the furnace of each boiler into a hopper immediately below, and are discharged into the wagons through a door which forms

SPECIAL WAGON WITH REMOVABLE BED FOR HAULING COAL TO THE PLANT

the rear wall of the hopper and is opened and closed by air. A soot hopper back of the bridge wall, built of steel and lined with fire brick, permits the accumulation of soot which is discharged through an opening controlled by a slide door into a wagon or car directly underneath. The eight steel stacks, each 7 ft. 6 ins. in diameter, and which rise 75 ft. above the roof of the boiler room, are supported on cross girders above the boilers. The bases of the stacks are about 30 ft. below the roof, and the support offered by the trusswork of the roof removes the necessity of guy wires or other braces. With the exception of the lower one, which is 3/8 in. in thickness, the steel plates of the stacks are 1/4 in. thick. That portion of the boiler room above the boilers and between the two rows of stacks is taken up by the coal bunkers, which have a total capacity of 1000 tons. The side walls of the bunkers, which are of concrete, rest upon the same girders that support the stacks, while the bottom of the bunkers is V-shaped and opposite each boiler opens into down-takes which feed the coal into the hoppers of the stokers.

HANDLING OF FUEL

One of the most noteworthy features of the whole plant is the method of elevating the coal to the bunkers. The method is entirely original with Mr. Davidson, and is in fact such a departure from the usual practice that many visiting engineers when shown the plans doubted its practicability. It has, however, proven a most successful method both from the standpoint of economy and reliability. Two 24-inch I-beams over the center line of the bunkers and immediately under the roof carry traveling trolley cranes of special design which run the full length of the boiler room and at one end project out through a door several feet beyond the wall of the building. Coal is hauled to the plant in wagons provided with beds of special design, as shown in the drawings on the opposite page. The wagon is run over a pair of scales immediately under the projecting I-beams. After being weighed a crane on one of the I-beams overhead lifts the bed containing the coal from the wagon by means of the chains attached to the hinged doors forming the bottom of the bed, and carries it into the building and over the bunkers. When in a position to be dumped, heavy hooks attached to the crane are spread and engage in the iron braces riveted to the sides of the bed, so that when the crane is lowered the weight is taken off the bed and the bottom is allowed to swing open. The two cranes traveling on the separate I-beams work independently. One of them will lift a six-ton load of coal, dump it and return the empty bed to the wagon in three minutes. As the crane is operated by an apprentice boy, and moreover as the expense of maintenance of the crane is practically nothing, it may readily be seen that this method of handling coal offers many advantages. The cranes were employed during the installation of the boilers and other apparatus in the boiler room, and their use during the erection of this apparatus lessened the cost of installation an amount sufficient to warrant their erection for this purpose alone. These cranes are of special design and were built by Pawling & Harnischfeger, of Milwaukee.

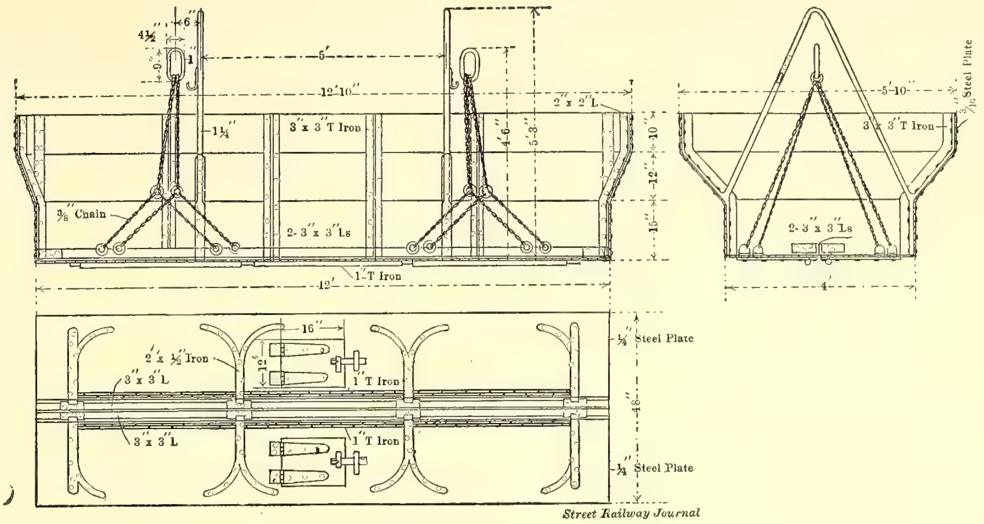
BOILER FEEDING

That portion of the basement of the boiler room underneath the firing alley or central passageway between the boilers is termed the pump room, and contains four motor-driven rotary pumps, four double-acting, steam-driven boiler feed pumps, and four Hoppes heaters. The two rotary

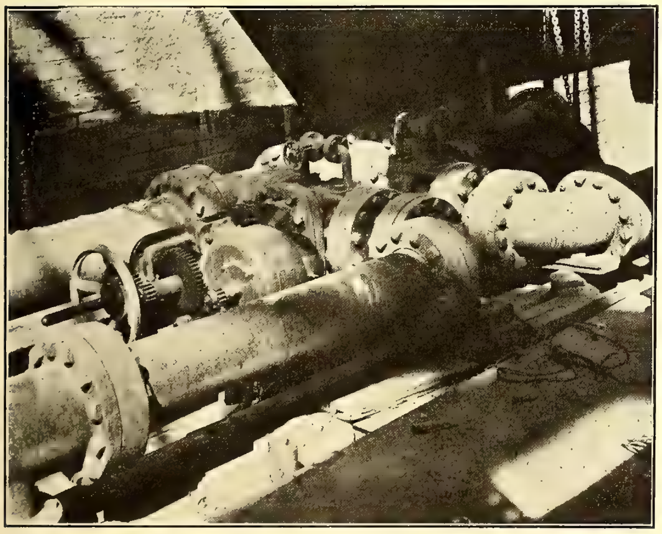

A WAGON BED LOADED WITH COAL BEING ELEVATED BY THE CRANE

pumps, two steam-driven pumps and two heaters in each half of the station may be operated independently of the set in the other half, and each set of rotary, steam pump and heater may also be used separately. This gives four independent sets of pumps for feeding the boilers. Failure of the feed supply is made a more remote possibility by the fact that three methods of feeding may be employed. The usual method is to pump

the feed water by means of the motor-driven Lawrence centrifugal pumps from the hot wells into the Hoppes heaters placed overhead in the pump room. The hot wells are connected by 18-in. pipes to the tunnel under the operating room into which the condensers discharge. The double-acting, steam-driven Prescott outside-packed feed pumps draw the water from the heaters and force it into 4-in. mains which run the full length of the boiler rooms and from which the feed pipes to the separate boilers are tapped off. In case of failure of the centrifugal pumps or of the heaters, the feed water may be drawn direct from the hot wells and forced into the boiler by means of the steam-driven pumps. The third method does not require the use of the steam-driven pumps or of the heaters. The centrifugal pumps supply small reservoirs into which the suction pipes of the injectors on each boiler terminate, and the boilers are fed by means of the injectors. As the feed pumps are the most vital parts of a plant, pumps of such a size have been installed as to insure their not being overworked and the consequent possibility of their being in constant need of repair. The cylinders of the steam pumps are in fact 18 ins. x 10 ins. x 18 ins., and at the maximum capacity of the plant two of the four installed will feed all of the boilers. No feed water purifying apparatus is installed at present, but provision has been made for it, and it is the intention of the company to install feed water purifiers within a short time.



DETAILS OF COAL WAGON-BOX



PIPING IN THE REAR OF THE BOILER DURING CONSTRUCTION, SHOWING THE ELECTRICALLY OPERATED VALVES

STEAM PIPING

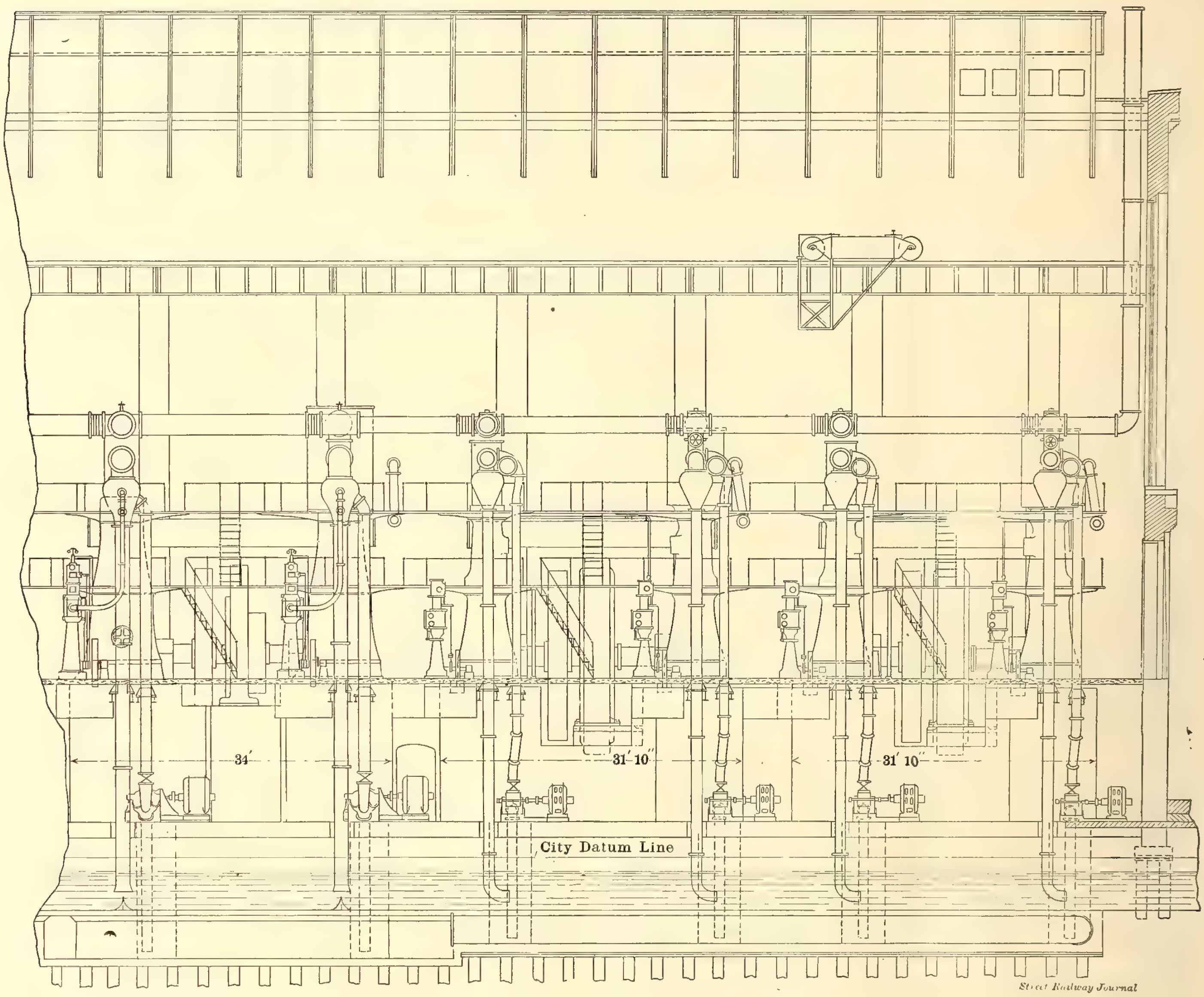
In laying out the main steam piping, endeavor was made to secure independence of the separate units and the two halves of the plant, to place the least amount of piping necessary in the engine room, and to provide for shutting off any section to which accident might occur. The drawing on page 126 shows the arrangement decided upon. Each set of two boilers feed into a common main which goes direct to a generating unit. Arrangements are also provided so that the main from each set of boilers may be connected to the steam header of that half of the station in which the boiler is located. The piping in the engine room was simplified by reversing end for end one line of engines and thereby bringing the throttle valves of the engines reversed next to the boiler room wall. At the same time reversing the engines avoided the necessity of any of the pipes crossing over each other in passing to their respective engines. It may be noted that the steam is taken out of the front of that line of boilers farthest from the operating room. While this reduced amount of piping in the boiler room it also lessened the required size of the building because the rear wall of the building could be constructed closer to the boilers.

Motor operated valves of the Chapman type are placed in the steam mains, and it may be noted here that this was the first installation of these valves in high-pressure systems of steam piping. While the valves can be closed from the switchboard, they are so connected electrically that they must be opened by hand. This arrangement was carried out to avoid the possibility of the distant switchboard operator accidentally or otherwise opening a valve at a time when the piping was disconnected and when workmen might be injured by so doing. The stop valves in the pipes from the individual boilers are of the motor operated type, as are also the valves in the mains from each set of two boilers and all the valves in the connections to the headers previously referred to.

There is no connection whatever between the headers in the north and south halves of the boiler room. While such connection might at times facilitate the operation of the plant, it was thought best to provide no means of connection between them and thereby reduce the dependence of one-half of the station upon the other half. Although they are termed headers, these lines connecting the mains of all the boilers in each half of the plant are not headers in the usual sense. In ordinary operation the supply of steam to each engine does not feed through them, and they serve simply to balance the pressure of the boilers and to provide for connecting any engine in half of the plant to any boiler in the other half. In fact, all of the reciprocating engines can be operated independently of them so that they may be disconnected for repair without affecting the operation of the plant other than putting the Curtis turbines out of service. These turbines are supplied with steam from the headers through mains which drop down from the north end of each header and pass along the boiler room walls and under the floor of the operating room to their respective turbines.

THE ENGINES AND GENERATORS

In building the concrete foundations for the generating units a practice somewhat out of the ordinary was followed. The foundations for all of the units are built in a monolithic mass, and are not separated from each other as is usually the custom. Reference has already been made to the fact that the generating units have been erected with very little clear floor space between them, and a good idea of their nearness to each other may be obtained when it is considered that eight units with a total rated capacity of 14,000 kw are installed in a space measuring 55 ft. 3 ins. x 156 ft. 11 ins.



LONGITUDINAL SECTION OF PART OF THE ENGINE ROOM

All of the engines are of the Allis-Chalmers vertical cross-compound type, with a speed of 94 r. p. m., while the generators were built by the General Electric Company. The rating of all of the generating apparatus is based on specifications drawn up by Mr. Beggs, which provide for a temperature of 40 deg. C. in the operating room instead of 25 deg. as allowed by the American Institute of Electrical Engineers. The four generators erected in that half of the plant first constructed are of 15,000-kw capacity, generating three-phase current at 13,200 volts and 25 cycles. The four installed later are 2000-kw, 600-volt direct-connected machines. The units first installed were the largest that could be obtained within the limited time in which it was necessary to have them and those in the second half of the plant were the largest that could be employed and preserve the symmetry of the two halves, which was considered highly desirable.

Two galleries are provided around the engines. The lower one permits of access to the cross-heads and rocker arms, while the upper one just below the cylinders is at the same height as the switchboard gallery, to which it is connected by frequent passageways. The same practice is followed in the erection of the galleries surrounding the engines as in the construction of the foundations of the generating units, in that they are all bolted solidly together. Passageways are open from the gallery of one engine to that of another, so that an operator can pass from one engine to another without being compelled to climb up and down the stairways.

The independence of each of the eight separate units of which the whole plant may be said to be composed is further secured by an independent exciter unit for each 25-cycle generator. Each of these units consists of a 25-kw machine driven by a Curtis horizontal steam turbine, and is mounted on an extension of the bed plate of its respective engine. Usually the turbine set is employed, but the generators may also be excited from the motor-driven exciter installed under the south end of the switchboard gallery, or exciting current may be obtained from the Oneida Street plant which supplies direct current for city lighting service.

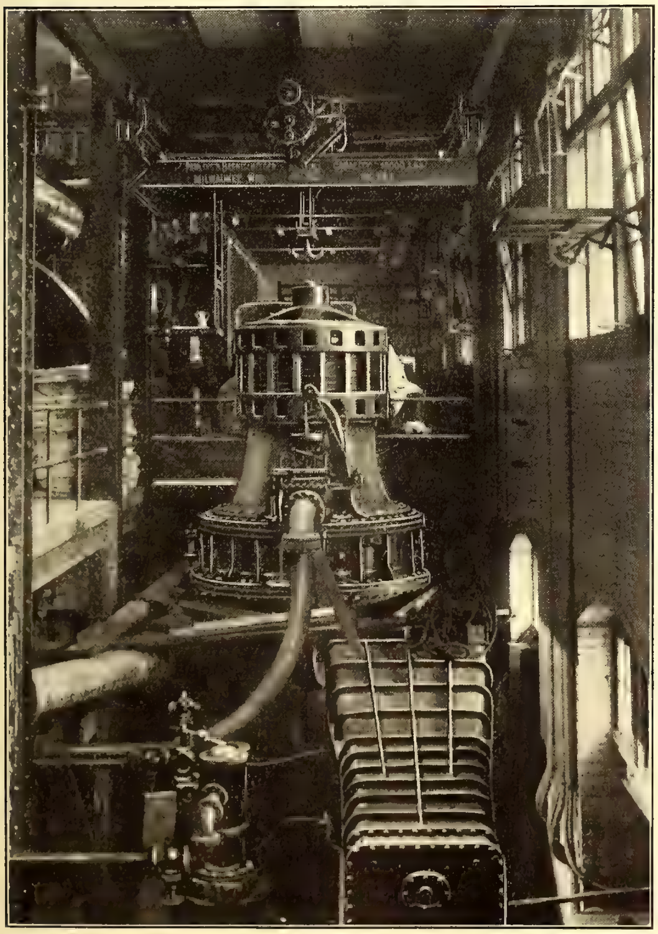
An illustration is presented of the two 1000-kw Curtis turbo-

generators installed under the north end of the switchboard gallery. Steam for these is not superheated to a greater amount than that supplied the reciprocating engines, as it is taken from the steam headers in the boiler room as already described. The condensing apparatus for each of the turbines consists of a surface condenser supplied with a 30-hp, 60-cycle, three-phase induction motor-driven centrifugal circulating pump and a vertical steam-driven dry vacuum pump. The water of condensation is removed from the condensers by a centrifugal pump driven by a 3-hp, 60-cycle, three-phase induction motor.

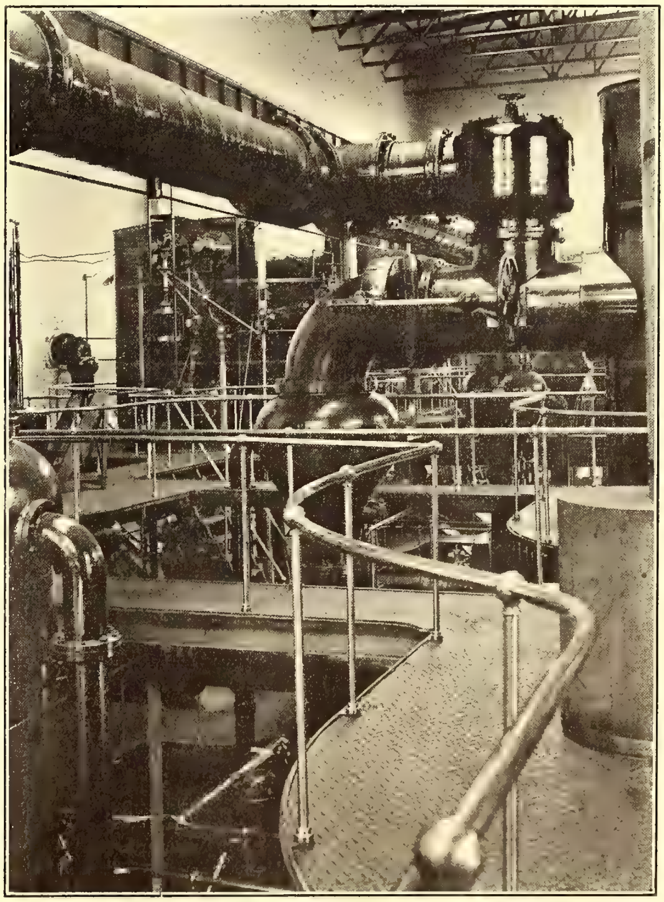
CONDENSERS

The position of one row of the larger generating units is reversed, as already described. This was done partly to simplify the steam piping, but primarily because it made possible the placing of all the condensers in the space between the two rows of generators. The condensers are all of the barometric type except those receiving the exhaust from the two 1000-kw Curtis turbines. These latter condensers are surface condensing; each has 4000 sq. ft. of 1-in. tubing. Those in the older portion of the plant are of Worthington manufacture, while those installed later, including those used with the turbines, were made by the Fred M. Prescott Steam Pump Company, of Milwaukee, after designs furnished by Mr. Davidson. The condenser, of which a cross-sectional view is shown, combines the principles of the ordinary jet siphon with that of the barometric type condenser. The velocity of the particles of water in the inner pipe tends to entrain the air and draw it out of the condenser. In case of a surplus of water the opening at the top of the inner pipe provides means for the surplus overflowing into the outer pipe. With this type of condenser it is possible to maintain a vacuum of about 27 ins. without the use of the air pump; in

CONSTRUCTION VIEW OF PASSAGE-WAY UNDER THE BOILERS

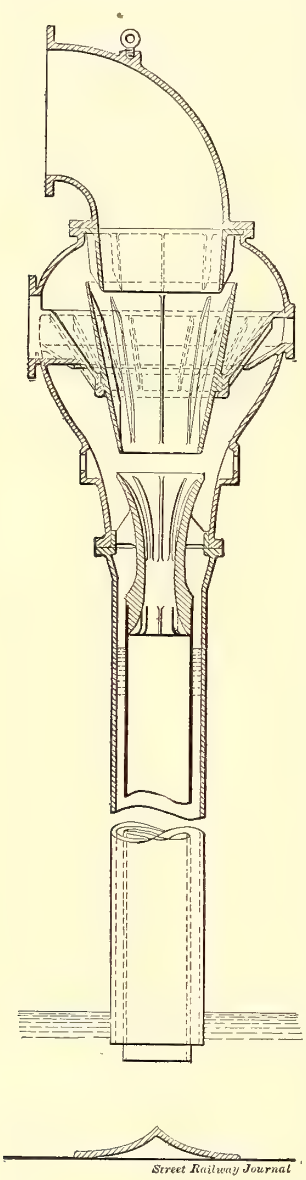


CONSTRUCTION VIEW, SHOWING ONE OF THE TWO CURTIS TURBINES UNDER THE NORTH END OF THE SWITCHBOARD GALLERY



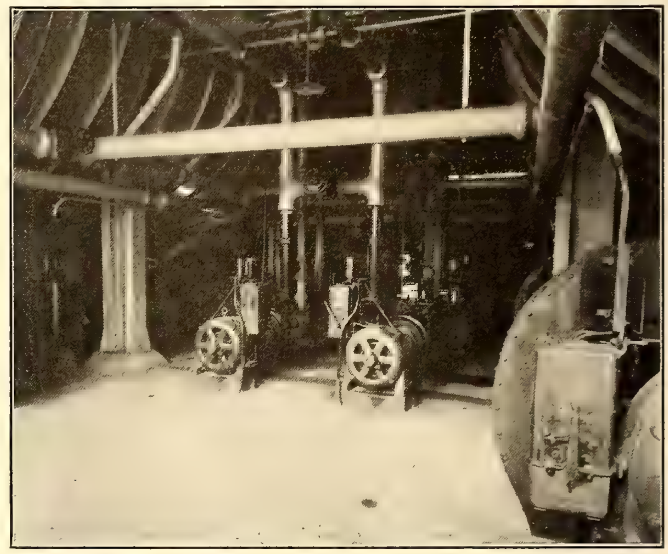
VIEW IN ENGINE ROOM, SHOWING PLATFORMS, CONDENSERS AND ATMOSPHERIC EXHAUST CONNECTION

fact, the air pump is not used under ordinary operating conditions. In the winter season a 28-inch vacuum is frequently obtained. A vacuum of 27 inches in the locality of Milwaukee is, of course, equivalent to one almost an inch higher in cities which are practically at sea level, as New York. For supplying condensing water two tunnels are run from the river under the boiler room and connect with a tunnel running the full length of the operating room and about 10 feet below the basement floor. Immediately above this is the tunnel into which the condensers discharge. This upper tunnel has an outlet into the river at one end and is also connected to the two hot wells under the boiler room basement floor. As the water level in this discharge tunnel is determined by the level of the water in Lake Michigan, which is practically constant, there is no danger of the condenser seals being broken.

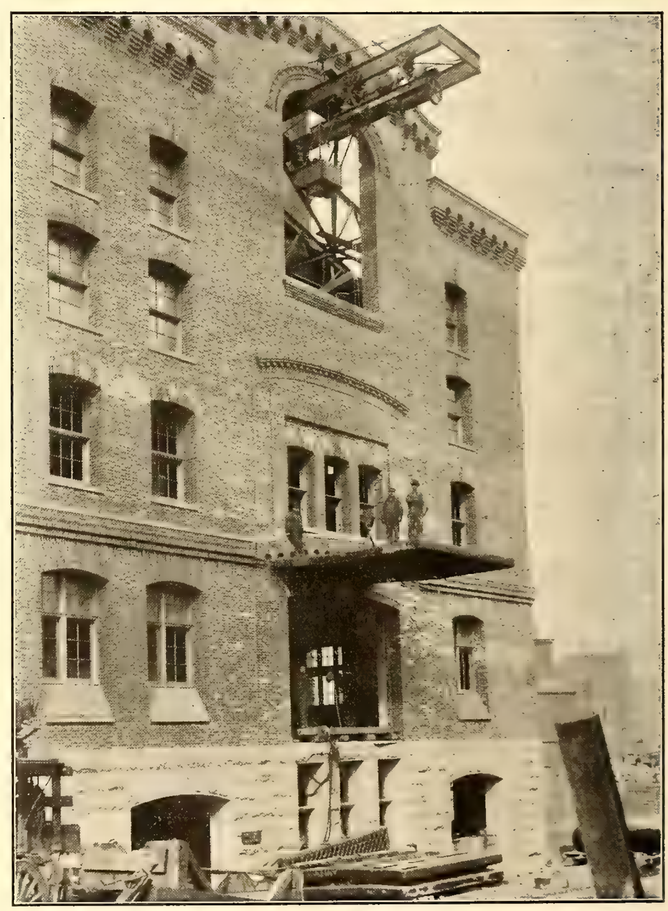


BAROMETRIC CONDENSER

Water from each condenser is drawn from the lower tunnel by means of a 12-in. centrifugal pump located in the basement and driven by a 50-hp motor which is provided with a double-throw starting switch. In starting the motors the switch is thrown down and the motors are put on the station bus-bars. After having attained speed the switch handle is thrown upward and this connects the motors to the terminals of the generator driven by the engine to which the condenser is connected. While this method of connection provides for the automatic stopping of the condenser pump in case the field circuit of the generator should be accidentally broken or the voltage of the generator drop for any other reason, it was devised primarily to avoid the shutting down of the condenser pumps in case the current should be cut off the bus-bars, through the blowing of all the machine breakers or otherwise. Atmospheric exhaust is provided for all of the engines by an exhaust line varying in size from 20 to 24 ins. which runs the full length of the building between the engines and immediately over the condensers. The arrangement of the connection of the engine exhaust with this line as well as with the condensers is well shown in an accompanying illustration. At each end of the plant the exhaust main is carried up along the wall and out through the roof of the building, which arrangement gives a clear space overhead for the operation of the 30-ton Pawling & Harnischfeger crane spanning the operating room. At the north end of the exhaust line a main drops down to receive the exhaust from the Curtis turbines whenever it is desired to run these non-condensing. The exhausts from all of the dry vacuum pumps, exciter turbines, boiler-feed pumps, and other steam-driven auxiliary apparatus is piped to the Hoppes heaters under the boiler room, and an outlet leading from this heater passes out the boiler room roof at the northeast corner of the building. In the design of the plant the division between steam and electrically driven auxiliaries was so made that all the exhaust from the steam-driven auxiliaries would be condensed in the feed-water heater. Under ordinary operating conditions practically no steam passes out of the heater exhaust.



PUMP ROOM IN THE BASEMENT OF THE BOILER ROOM, SHOWING THE MOTOR-OPERATED CENTRIFUGAL PUMPS

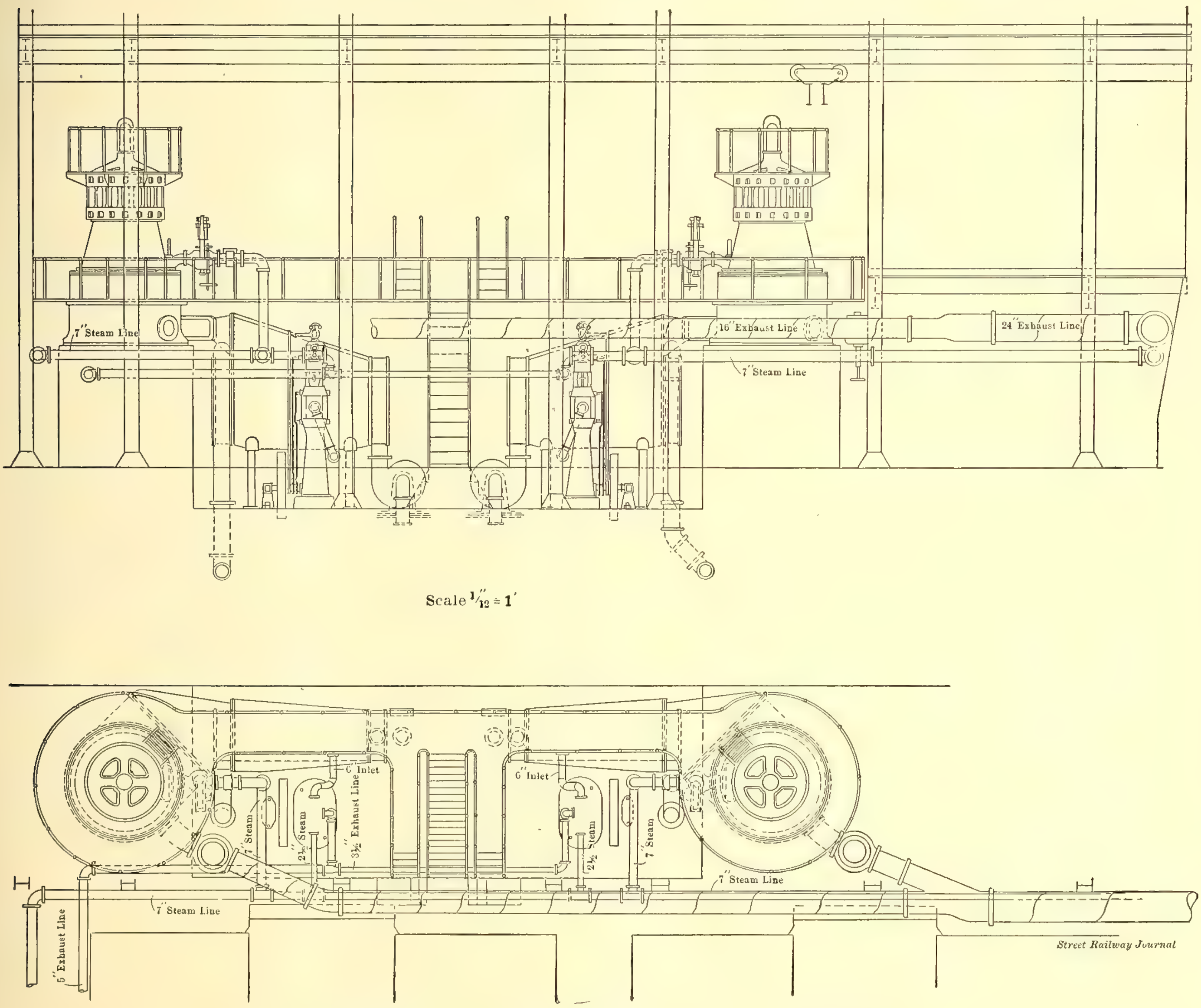


CRANES IN USE AT THE COMMERCE STREET STATION IN ERECTING THE BOILERS

OILING SYSTEM

A central oiling system consists of tanks in the basement, filters of special design, storage tanks on the third or top gallery floor, and pumps for elevating the oil from the tanks

in the basement to the filters. The tanks in the basement are long, rectangular in shape, and so built that a barrel can be rolled on skids over them. In this way the contents of the barrel can be discharged into the tank by simply knocking out the bung and rolling the barrel over. The barrels can be unloaded directly from the wagons bringing them to the plant onto the skids over the tanks. The oil is filtered by allowing it to flow through muslin bags. The small pumps which raise the oil to the reservoirs are submerged in the oil tanks in the basement. The neglect usually accorded small oil pumps in a large plant, and their consequent unsightly appearance and constant need of repairs, was responsible for Mr. Davidson's plan to immerse them in oil and operate them by compressed air. Pending the installation of the compressor and piping they were connected to the steam piping. It was then found that the radiation from the cylinders heated the oil just about warm enough so that it would filter well, and the steam connections have been allowed to remain. All wear and the necessity of repairs to the pumps has been practically eliminated by installing them in the oil. The connecting pipes are fitted with unions so that the pumps may be removed for inspection at any time.



TURBINE LAYOUT IN COMMERCE STREET POWER PLANT

GROUNDING OF MACHINES AND INSTRUMENTS

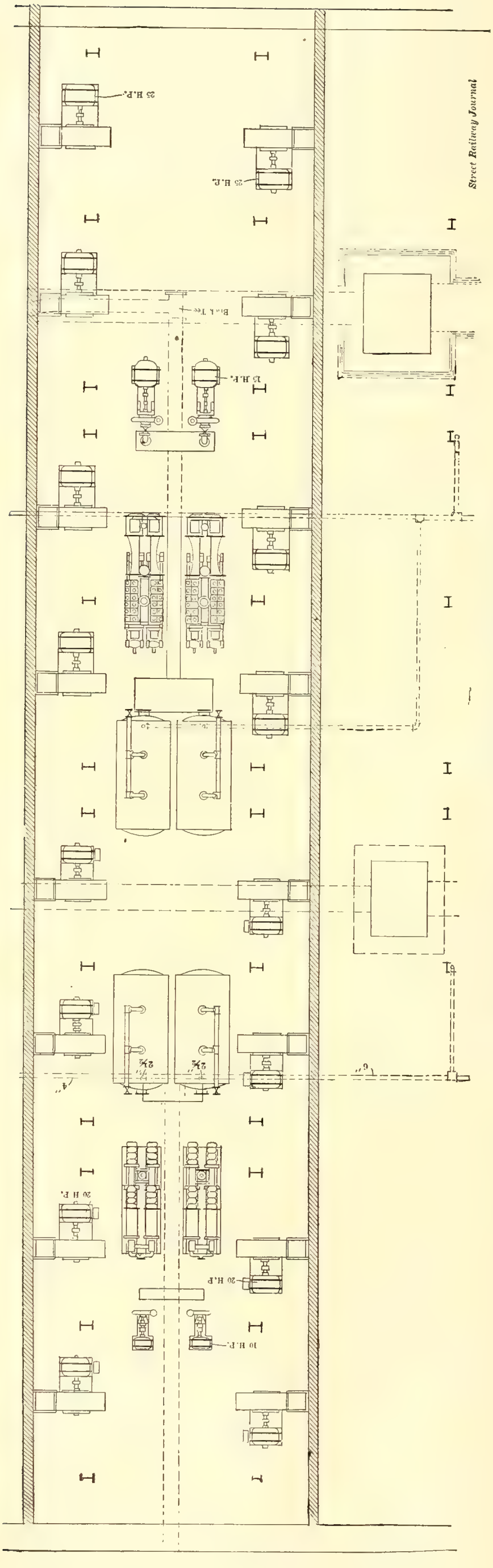
All of the machinery and apparatus is grounded to a common ground bus in the basement of the building. The large alternating current generators which are star connected have their neutral points grounded through rheostats. Grounding of the direct current machines is effected through a switch and circuit breaker, which are located in the basement but are controlled from the switchboard in the gallery. The framework of all the bus and switch structures in the basement is well grounded, as is also the framework of the alternating current switchboards. On the direct current board, however, the framework is insulated from the ground.

CLEANING WASTE

Complete apparatus for cleaning waste is installed in the basement of the engine room. The dirty waste is thrown into a chute opening into the engine room and falls into a bin below. It is first put through a steam-driven centrifugal separator similar to those found in laundries for drying clothes, and all the surplus oil removed. It is then boiled in a solution of soda, after which it is put through a second separator which frees it of surplus water. Finally it is placed on the steam pipes and dried. About 70 or 80 per cent of the oil is removed by these processes and the waste is left in good condition to be used again.

COMPRESSED-AIR SYSTEM

Two 75-ft. motor-driven Christensen compressors in the boiler-room basement compress air which is piped through



PLAN OF PUMP ROOM IN THE COMMERCE STREET POWER PLANT

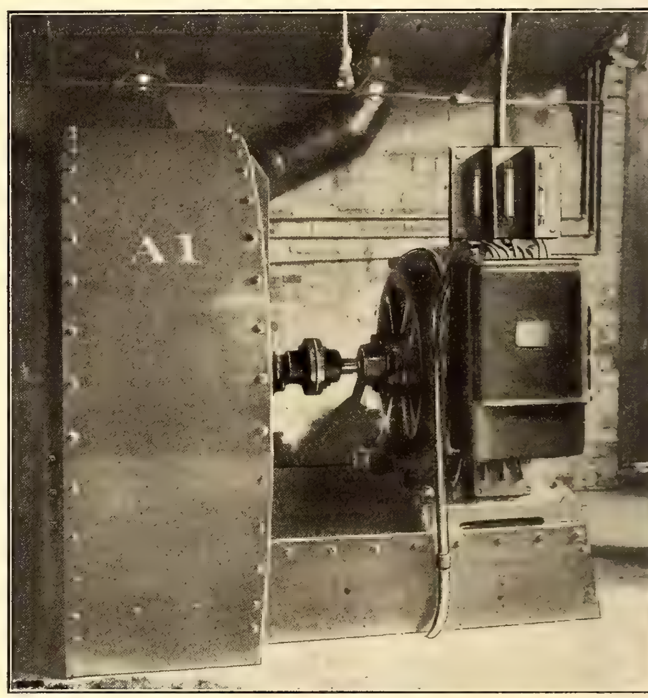
the building and is used for operating the air-lift doors of the ash hopper, blowing out machines and for operating pneumatic hammers, drills, and other tools.

TESTING APPARATUS

Frequent calorimetric tests of coal are made, and coal is also tested frequently by burning the sample to be tested under the boilers. To aid in making these latter tests two large weighing tanks have been installed in the basement of the boiler room and a separate feed pump has been provided for feeding the boiler to be tested. There has also been installed in the same basement a surface condenser into which the exhaust from any of the auxiliary apparatus can be turned when it is desired to test any piece of this apparatus.

MACHINE SHOP AND REPAIR EQUIPMENT.

All the repair parts for the plant are made in the machine shop located on the second gallery floor. Here is installed a complete equipment of machine tools consisting of several lathes, shaper, drill presses, tool grinder, gas forge, buffers, and others, all of which have individual motor drive. When the north half of the plant was erected many of the fittings and other parts necessary were constructed in the shop. Among those parts made were the air lifts for the ash hoppers under the boilers, the turbine galleries and stairways, the coal down-takes in the boiler room, and the extra heavy pipe flanges used on the larger piping. In addition to this work all piping construction about the plant was done by the company.



MOTOR-DRIVEN BLOWERS SUPPLYING FORCED DRAFT TO THE BOILERS

MOTOR-DRIVEN AUXILIARIES

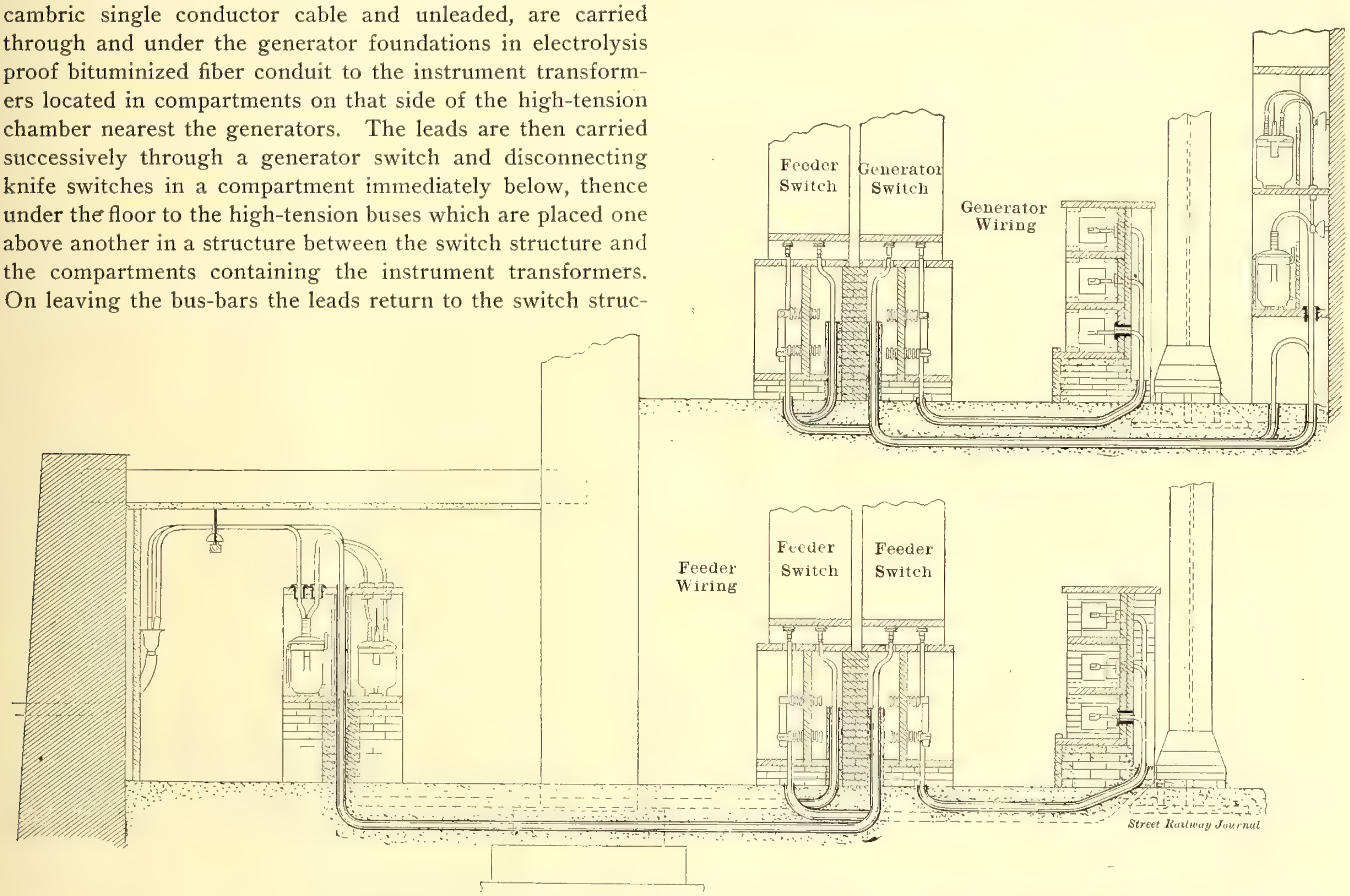
The motor-driven auxiliaries, to which reference has been made occasionally in the previous description, are arranged as follows: In the 25-cycle portion of the plant, 25-cycle induction motors are used; in the direct current portion, direct current motors are used, and in the 60-cycle portion, 60-cycle induction motors. Their plan prevents an accident to one part of the plant shutting down the auxiliaries and thereby disabling other portions of the plant.

THE SWITCHBOARD SYSTEMS

The station contains three separate switchboard systems, one for the direct current apparatus, one for the 25-cycle alternating current machines, and another for the 60-cycle machines. The 25-cycle alternating current switchboard system comprises the apparatus in the high-tension chamber in the basement under the south end of the switchboard galleries and the controlling and instrument panels, or the switchboard proper, in the gallery above. The plan of sectionalizing the different machines, so prominent in other parts of the plant, is followed in the 25-cycle switchboard apparatus by placing all of the high-tension apparatus located in the basement in four groups, one for each generator. Practically the only connection between the four groups is through the high-tension bus-bar sectionalizing switches. The three leads from each generator, which are of varnished cambric single conductor cable and unleaded, are carried through and under the generator foundations in electrolysis proof bituminized fiber conduit to the instrument transformers located in compartments on that side of the high-tension chamber nearest the generators. The leads are then carried successively through a generator switch and disconnecting knife switches in a compartment immediately below, thence under the floor to the high-tension buses which are placed one above another in a structure between the switch structure and the compartments containing the instrument transformers. On leaving the bus-bars the leads return to the switch structure and pass successively through disconnecting knife switches and an oil break feeder switch, and thence under the floor and up through the middle of the structure containing the feeder instrument transformers. On leaving this structure they are carried overhead for a distance of about 3 ft. and into the terminal bells of the lead-covered paper-insulated cables of the underground conduit system. As a safety precaution two feeders are run to each sub-station. These feeders are taken off of different generator bus sections and are, moreover, carried to their destination by routes which diverge just outside the plant. It may be noted that the only visible portion of the high-tension cables is that between the feeder instrument transformer structure and the terminal bells leading into the underground system. Moreover, the instrument leads and controlling wires connected to the transformers and to the switch motors are carried in iron conduit, so that there is practically no visible wiring in the compartment. Although the wiring is well concealed, there is ample provision for getting at any part of it for repairs or inspection. The bus and switch structures are of glazed brick, and are so constructed that the Alberene stone lining and barriers are readily removable.

It was stated that the switch and bus structures are in separate groups, one for each generator. The switch structures proper are built six switches in a group. One of these, which is centrally located in the group, is the generator switch, while the remaining five around it are in the feeder circuits. By building the switches back to back as shown in the drawing much room was economized, and since the manner in which the interlocking barriers are put together permits access to all the cables in the rear of the disconnecting knife switches, no serious drawbacks were introduced.

The high-tension buses are of ⅝-in. copper rods supported by panels of plate glass, which in turn are supported and held in position by specially designed porcelain feet. On top of the long bus structure are mounted the three oil break switches controlled from the switchboard in the gallery above for sectionalizing the bus-bar into four sections, one for each of the large a. c. generators. As a protection to workmen, disconnecting knife switches are placed in each bus on each side of each oil switch. The only high-tension leads that enter any other portion of the plant than the high-tension chamber are three sets of cables passing from feeder switches to the three 500-kw frequency changers located on the main floor immediately above. These leads, after passing through starting compensators, go direct to the 12,200-volt synchronous motors direct connected to 2300-3980-volt, 60-cycle, three-phase generators which supply current for residence lighting. Field excitation for these machines is regularly furnished by a 150-kw motor generator set installed near by. The frequency changers and the turbines which comprise the 60-cycle generating apparatus are operated in multiple and



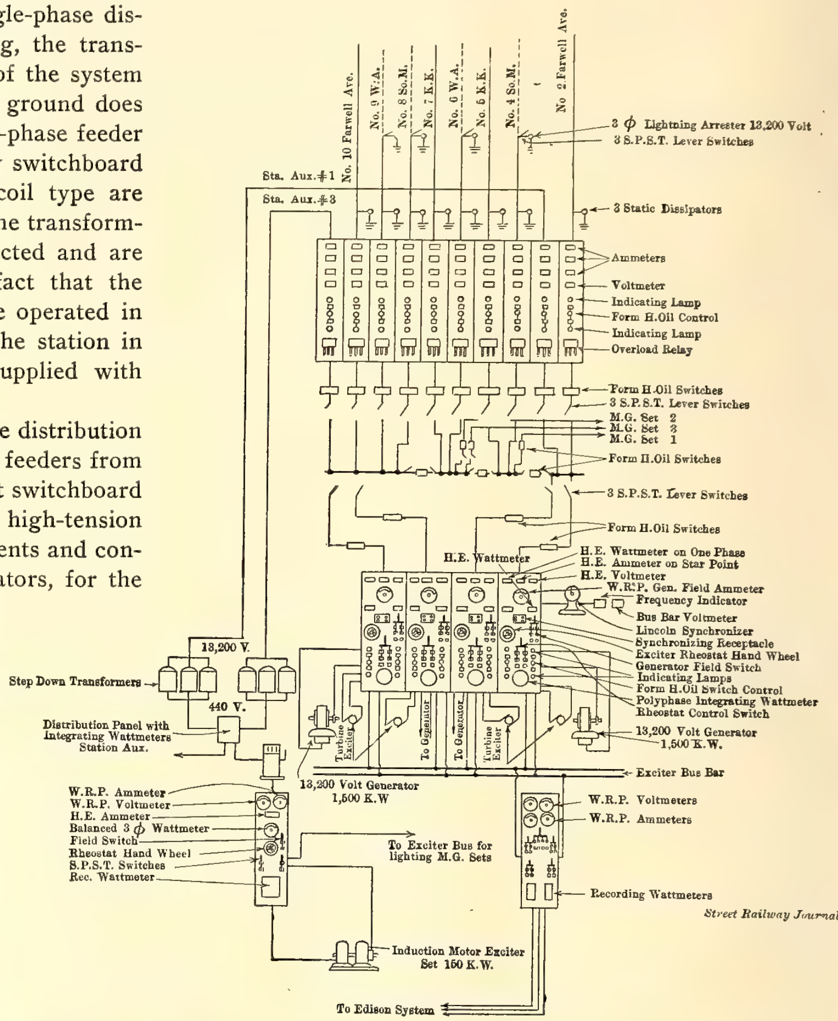
CROSS SECTION, SHOWING HIGH-TENSION WIRING IN BASEMENT OF COMMERCE STREET STATION

are employed for residence lighting and for supplying arc light transformer sub-stations with current. The 60-cycle generators are star-wound and the neutral points of all of them are connected to a common ground which branches out through the residence portion of the city. Single-phase distribution is employed for the residence lighting, the transformers being connected between the one leg of the system and a branch from the common ground. This ground does not return to the switchboard, so that the single-phase feeder panels control but one cable, as in street railway switchboard practice. Voltage regulators of the floating coil type are employed in the single-phase feeder circuits. The transformers in the arc light sub-stations are star-connected and are fed by three-phase transmission lines. The fact that the Curtis turbines and the frequency changers are operated in multiple throws all of the a. c. generators in the station in multiple, since the frequency changers are supplied with current from the large 25-cycle generators.

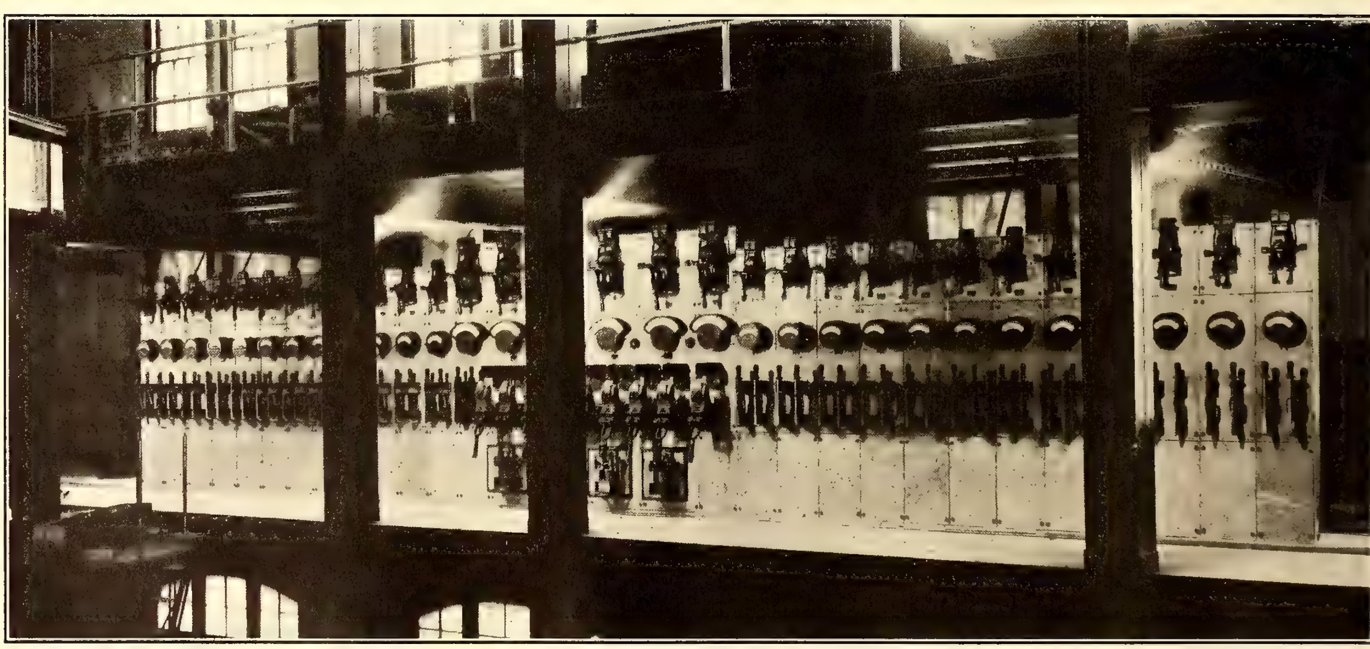
In addition to the feeder panels for the 60-cycle distribution system and a. c. exciter feeder panel controlling feeders from the Oneida Street station, the alternating current switchboard in the gallery includes the feeder panels for the high-tension feeders in the basement, panels carrying instruments and controlling switches for the four large a. c. generators, for the frequency changers, for the Curtis turbines, and for the motor generator exciter.

The 600-volt direct current switchboard is located in the north end of the switchboard gallery opposite the direct current generators. In addition to twenty-four feeder panels, and two panels controlling heavy feeders from the Oneida Street plant, it contains four generator panels and one transfer panel which is employed in connection with a transfer or extra bus to carry the load around a generator circuit breaker which may be out of order or which is being repaired. This bus in connection with the switches of the Oneida Street feeder panels may also be employed to throw any number of the feeders on the Oneida

heavy cast clamps, which construction avoids the necessity of drilling the bus-bars. The copper car connection between the switch and the circuit breaker on each panel is utilized



WIRING DIAGRAM OF THREE-PHASE, 13,000-VOLT SYSTEM



DIRECT-CURRENT SWITCHBOARD IN NORTH END OF SWITCHBOARD GALLERY

Street railway plant. The rear of the direct current board presents an exceptionally clean appearance. The buses are supported by and are connected to the switch terminals by

as a shunt for the ammeter on the front of the panel, and the leads to this meter and the circuit breaker alarm wires are the only ones on the rear of the board.

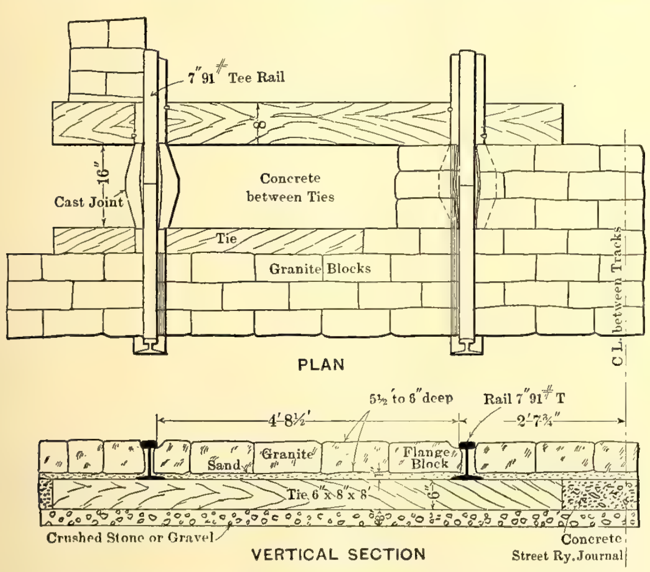
SUB-STATIONS

There are four sub-stations supplied by the Commerce Street plant. Sub-station No. 1, on Kinnikinnick Avenue, contains a 1000-kw General Electric and a 1000-kw National Electric rotary converter. No. 2 sub-station, at Farrell Avenue, contains two 500-kw General Electric rotary converters. The third sub-station is at South Milwaukee and contains a 500-kw General Electric rotary converter and a 150-kw, 440-volt, three-phase induction motor belted to a two-phase, 2400-volt generator which supplies the lighting system of South Milwaukee. Two 1000-kw rotary converters, together with a motor-driven generator similar to that in South Milwaukee, are installed in sub-station No. 4, at West Allis. In this station there will shortly be installed several 33,000-volt, three to two-phase transformers for furnishing current to operate a new single-phase extension of the railway system.

In addition to the a. c. feeders to the separate sub-stations, the Commerce Street plant is connected to all of the sub-stations by heavy feeders going direct to them and also by the trolley system which is interconnected. This interconnection places all of the generating apparatus in the Commerce plant in multiple operation, since the a. c. and d. c. generators are connected through the sub-stations and feeder systems.

TRACK CONSTRUCTION IN MINNEAPOLIS AND ST. PAUL

During the past two years the Twin City Rapid Transit Company, of Minneapolis and St. Paul, has been making extensive improvements in its track construction in the two cities in which it operates. Quite a lot of the track has been built after the construction shown in the accompanying drawing. The rails are laid on 6-in. x 8-in. x 8-in. ties resting on crushed



T-RAIL CONSTRUCTION BY THE TWIN CITY RAPID TRANSIT COMPANY

stone or gravel. About 35,000 ties have been creosoted for the new work. On straight track 7-in, 91-lb. T-rails bonded with cast joints are used. The rails of the special work are 110-lb and are of the grooved type. In the cast welding no attempt is made to keep the ball of the rail cool. George L. Wilson, engineer and roadmaster of the system, under whose direction the new work is being carried out, states that no trouble has been experienced with the softening of the ends of rails cast welded several years ago by the method at present in use. On straight track the rails are tied together every 10 ft. by 1-in. tie rods, and special work which is not cast welded is tied with ¼-in. rods. The spaces between ties and beyond each end of them is filled with concrete. Upon this is laid a 1-in. layer of sand, and this underlies granite blocks 5½ ins. to 6 ins. thick. After the blocks are laid, cement is poured between the cracks.

The half-tone illustration accompanying shows a portion of the new track, on Hennepin Avenue, Minneapolis, near the

NEW TRACK CONSTRUCTION ON HENNEPIN AVENUE, MINNEAPOLIS

offices of the company, under construction, and also some of the old track which is being torn out. In building the new track on double-track lines, to interfere with traffic as little as possible, temporary cross-overs are put in about two blocks apart, and one track is used between the cross-overs while the other is being reconstructed.

CINCINNATI COMMERCIAL MEN ADMIRE ELECTRIC INTERURBAN PROGRESS

About twenty-five members of the Cincinnati Commercial Club made a tour a couple of weeks ago by electric lines from Cincinnati to Dayton, Indianapolis, Muncie, Anderson, and other points in Indiana. This was the annual trade-inducing trip of the organization, and this year it was decided to make the trip on traction lines. The party was under the special charge of D. G. Edwards, of Cincinnati, traffic manager of the Schoepf-McGowan interurban lines in Ohio and Indiana. The traction terminal station at Indianapolis was a revelation to the Cincinnatians, and it was agreed that the business men of the city should use every effort to enable the interurban lines to enter the heart of the city, something that is impossible at present, owing to the use of broad-gage tracks by the city lines of that place.

Of interest to street railway companies throughout Pennsylvania, and indirectly to companies in other States, is the plank in the Pennsylvania State Democratic platform adopted at the recent convention at Harrisburg, at which Lewis Emory, Jr., was nominated for Governor, Jeremiah S. Black for Lieutenant Governor, William T. Creasy for Auditor-General, and John J. Green for Secretary of Internal Affairs, which declares that trolley companies should be given the right to carry freight and express matter. Another feature of the platform is the declaration that all grants of franchises to corporations should be limited to time, purpose and power, and should be reclaimable by the Commonwealth when public interest requires.

HAULING OF FREIGHT AND OTHER OPERATING FEATURES OF THE INTER-URBAN RAILWAY COMPANY, DES MOINES, IOWA

A number of interurban roads have taken up the matter of hauling of freight in a half-hearted way, but H. H. Polk, president and general manager of the Inter-Urban Railway Company, of Des Moines, Ia., regards the handling of freight of almost as much importance as taking care of passenger traffic, and as a consequence a freight business has been developed from which 30 per cent of the gross receipts of the road is derived. It is due largely to this fact that the road, which passes through a rather sparsely-settled country, is able to show satisfactory earnings. The general features of the system were described in the STREET RAILWAY JOURNAL for June 20, 1903.

THE 30-TON LOCOMOTIVE AND CABOOSE USED BY THE INTER-URBAN RAILWAY COMPANY

The system centers at Des Moines and extends east to Colfax, 23 miles; south to Fort Des Moines, about 5 miles; east to Valley Junction, about six miles, and at the present time northwest to Granger, 18 miles. The Granger division, however, is being extended to Perry, 35 miles, and to Woodward, 27 miles from Des Moines.

The road is one of the few interurban systems in the country having freight agreements with steam roads. Agreements on joint freight rates exist between the company and the Chicago & Great Western, the Iowa Central and the Minneapolis & St. Louis Railroads. These agreements provide for the interchange of cars and enable the road to ship car-load lots from any station along its line to foreign points. The system is well equipped for handling freight, and owns seventy coal cars, twelve box cars, two electric locomotives, and one 50-ton steam locomotive. The passenger stations along the line have been designated to include freight rooms. A terminal freight yard with capacity for 28 cars, with a freight house in connection, has been laid out in Des Moines, and stock yards and other facilities for shipping the products of the farms have been erected along the line. Moreover, several coal mines, tile mills and brick yards are so located that all their output must be handled by the Inter-Urban Railway.

The electric locomotives referred to were built in the shops of the Des Moines City Railway Company, which company is closely connected financially with the Inter-Urban Railway. The larger of the locomotives was completed in the summer of 1905, and was built under the immediate supervision of J. E. Welch, master-mechanic of the shops. It weighs 60,000 lbs. and is equipped with four General Electric 73 motors. The bottom framing is of steel I-beams and of angle bars. In fitting these beams together, the ends of one beam where it butted up against the side of another were accurately machined to a perfect fit. The cab is large and roomy, and in addition to the control apparatus contains the air pump. One of the illustrations shows the interior of the cab, and the master controller of the type-M multiple-unit system with which the locomotive is equipped. Space between the trucks would not permit the contactors and rheostats to be hung under the car, and these are installed above the floor under one of the sloping ends. Access to them is gained through the sliding door shown in the interior view, and the compartment in which they are located is well ventilated by openings in the floor. This locomotive is equipped with both automatic and straight air engineer's valves. Usually the brake cylinder of the locomotive is shut off from the automatic air valve, and automatic air is used only on the freight cars in the train. In this case, straight air is used on the locomotive.

The locomotives handle trains up to fifteen cars in length without difficulty. The box cars and gondolas belonging to the company are of the same construction as used on steam roads. The former are of 40,000 and 50,000 lbs. capacity and measure 34 ft. in length inside. While the company uses cars of steam roads, it does not permit its own gondolas and box cars to leave its line, as much difficulty is experienced in getting them back again. One car has now been gone for more than a year, the company being unable to get it returned. As in steam-road practice, a caboose built similar to those used on steam roads is always drawn in the rear of a freight train. Three men, a motorman, a conductor and a brakeman, constitute a train crew. One of these is required to remain at the rear end of the train, and the caboose is employed largely because of this, as it affords a shelter for the brakeman in cold or inclement weather. It is also utilized to carry tools.

The freight hauled over the line may be divided into two classes, car-load lots and less than car-load lots, the latter being handled chiefly by what are termed express cars. Two of these are in service. One makes two trips per day from

A FREIGHT TRAIN ON THE INTER-URBAN RAILWAY

Des Moines to Colfax, leaving Des Moines at 8:00 a. m. and 3:00 p. m., while the other leaves Des Moines for Granger at 8:00 in the morning and in the afternoon and makes one trip to Valley Junction and one to Fort Des Moines. Car-load lots are handled by the two freight locomotives. One of these is employed almost exclusively for local switching in Des Moines, while the larger ones handle the output of the brick and tile mills and coal mines about Des Moines and

hauls trains to Altoona, Mitchellville and Colfax. The daily capacity of the five mines depending entirely on the Inter-Urban Railway is about five cars each. The handling of the output from these mines, together with that of the Flint Brick yards with a capacity of 100,000 brick per day, and of the Des Moines brick and tile company, serves to keep one locomotive busy a considerable portion of each day. The greater part of the output of all of these is hauled to Des Moines and is distributed to several yards in the city. All the coal for the power plants of the railway systems and of the Edison Electric Light Company, as well as the freight to and from Fort Des Moines, is handled by the road. All deliveries to the Fort are made into the grounds of the reservation, and passenger coaches containing troupes en route to the fort are transferred from the Chicago & Great Western and are hauled inside the reservation. In addition to the freight from manufacturing industries, quite a volume of business is obtained from the farmers. The agreement with the Great Western Railroad enables the Inter-Urban Railway to ship stock in car-load lots from any point on its line direct to Chicago, and to facilitate the loading of stock four stock yards have been built on the line to Granger. The company employs a traveling freight agent to work among the farmers continually. The solicitor makes it his business to associate with the farmers and to get thoroughly acquainted with them. He learns what stock or produce each farmer expects to ship, and about the time these shipments will be made, and as the time for the shipments of stock grows near he makes arrangements to have a stock car at the nearest stock yards at an appointed time. Shipments of hay and grain are taken care of in a similar manner. The solicitor frequently has great difficulty in persuading the farmers to use the line. The farmer must be shown where time will be saved or cost lessened before he will consent to changing over from the steam road. In the matter of shipping stock, the Inter-Urban Railway has a decided advantage over the steam road in that by using it a shorter time is required in getting the stock from the farm to Chicago or into the market where shipment is made. Stock loses weight rapidly after being removed from its accustomed haunts. Often when the steam roads are used a stock car will stand loaded on a siding for several days, due to some error. The Inter-Urban Railway, however, moves the car as soon as the farmer is ready, and this, added to the fact that the long drive to the nearest point on a steam road is avoided, makes the time in transit between the farm and the market several hours shorter. The freight solicitor often obtains business by sending buyers favorably disposed toward the road to farmers who have produce to sell. In addition to soliciting car-load freight business he does much toward increasing the use of the passenger cars by farmers. When it is necessary for the average farmer to go to the city it does not occur to him that it is cheaper in the long run to go on the interurban line, spend probably 75 cents and get back home in two or three hours, than to hitch up a team and consume a day's time for himself and his team in making the same trip. It is the solicitor's duty to impress upon the farmer the fact that his own time as well as that of his team is of such value that it is to his advantage to use the line.

Considerable revenue is derived from carrying small freight packages to the farmers. The fact that telephones are found in almost every farmhouse has been of great assistance in developing this business. Should goods be required from the city the farmer can either telephone his wants direct to the merchant in town or he can save toll by telephoning to the nearest freight agent. This agent in turn will repeat the message over the company's wires to the freight agent in Des Moines, who in turn delivers it to the merchant. When the merchant delivers the goods to the freight house, the farmer is notified through the agents on what car his goods will arrive, so that he can be at the stop nearest his home to receive them.

The line has been of great convenience to the farmers in obtaining repair parts of farm machinery. On one occasion an accident occurred to a threshing machine at work about fifteen miles from Des Moines. Ordinarily a day would have been required to make the repairs. As there were about fifteen men employed the inconvenience and cost attending such a delay would have been considerable. On this occasion, however, the number of the broken part was obtained and the machinery dealer in Des Moines was notified by telephone to send a duplicate part on the Inter-Urban Railway. The result was that the threshing machine was ready

INTERIOR OF LOCOMOTIVE CAB, SHOWING ARRANGEMENT OF CONTROL APPARATUS

for operation in a little more than an hour after the accident.

The company also handles a great deal of milk. Milk tickets are sold at 10 cents for a 10-gallon can. The ticket has a stub attached which pays for the return of the can when empty. The tickets are sold in quantities to the farmers, who simply tie them on to the cans and leave the cans on platforms along the track. No special milk trains are run, but F. S. Eberhart, superintendent of the system, to whom acknowledgment is made for much of this information, states that such trains will most probably be put on in the near future.

Secretary Swenson, of the American Street and Interurban Railway Association, has issued data sheets Nos. 7 and 8, relating respectively to "Promotion of Traffic" and "Municipal Ownership." These sheets are being mailed to the member companies to secure information for the reports of the standing committees on these subjects to be presented at the Columbus convention next October.

SHOP KINKS AT TOPEKA, KAN.

The new construction work and general features of the Topeka Railway Company, of Topeka, Kan., were described at some length in the Street Railway Journal for Nov. 11, 1905. No mention, however, was made of the shop practice, or of several devices that have been developed in the shops by S. T. French, foreman of the shops, and others of the shop employees.

One of the most interesting of the devices is probably that by which power is employed to operate a hand driven wheel press. The press is of the screw type and was made several years ago by a local machine shop. While the press is required occasionally, it is not used to an extent that would warrant the purchase of a power driven hydraulic press of the later type. Formerly when wheels were removed or pressed on it it was necessary to call all of the shop employees, and sometimes several track men, to work at the lever. To avoid this inconvenience the apparatus shown in Fig. 1 was devised. A rope attached to the press lever passes up over a pulley near the roof and then down and around the drum shown. The drum is keyed to a short shaft, the bearing on one end of which has a vertical motion of a few inches. Pressing down the lever shown pulls this end of the shaft down and the belt is tightened on the driving pulley and the lever of the wheel press is pulled up. Releasing the operating lever allows the wheel press lever to fall by its own weight. The device, while rather crude, results in considerable saving of time and labor.

FIG. 1.—DEVICE FOR APPLYING POWER TO A HAND-OPERATED WHEEL PRESS

Some devices for babbitting bearings are shown in Fig. 2. Those for half shells, as well as those for commutator end armature bearings, are made in several sizes. The method of clamping the half shells can be seen in the reproduction. The shell is placed on the half mandrel, the lugs are placed in the oil ways and the cap is then placed over the bearing. The bearing is raised a sufficient amount above the lower block to allow the proper amount of metal to flow over the end and the whole is then clamped in position by throwing the lever down.

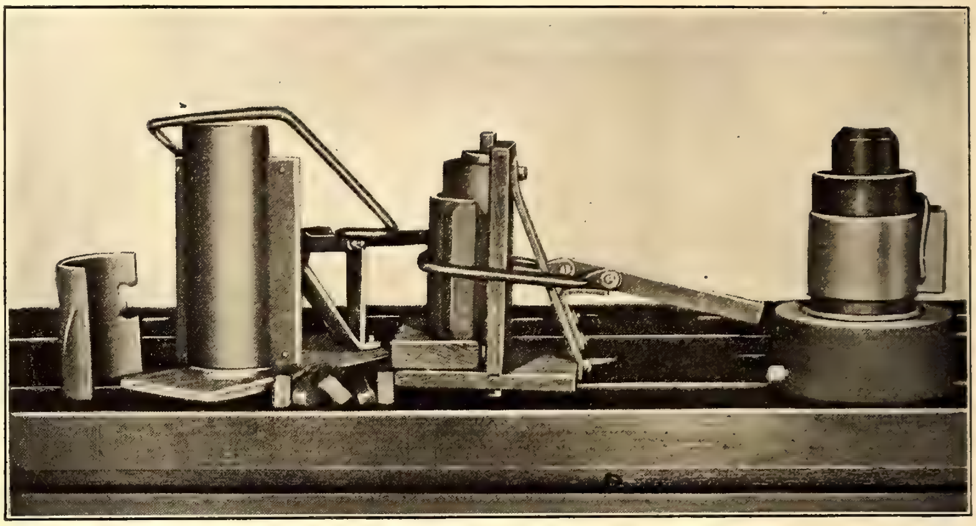


FIG. 2.—DEVICE FOR BABBITTING BEARINGS

For babbitting round bearings a cast-iron block is turned to receive the head of the bearing. A mandrel with a slight taper fits snugly in a hole through the center and is held in position by a set screw. The oil-ways are filled with lugs which are held in position by a sheet iron band. After the babbitt has been poured the set screw is loosened and one or two slight taps with a hammer drives the mandrel down through a hole in the support for the cast iron block. The bearing can then be removed.

The Topeka shop is equipped with two drill presses, one of which was very seldom used. This has been fitted in the manner shown in Fig. 3, with a jig for boring bearings. Several collars or bushings of different sizes are provided, so that one base block receives all the different diameters of bearings used. The bushings extend around the bearing more than half the circumference and this enables them to hold the two halves of split bearings in the proper position. The cutter bar fits snugly through the center hole in the table of the drill press and is thereby held firmly in position. After the tool boring the inside of the bearing to the proper diameter has been run through the bearing, the cutter bar is lowered a few inches more and the face of the bearing is trimmed by

the upper and longer tool shown in the illustration.

A rather unusual but effective method of testing the wear of armature bearings is practiced by means of the device shown in Fig 4. This gage is clamped over the flange of one of the I-beams, extending across the pit in such a manner that

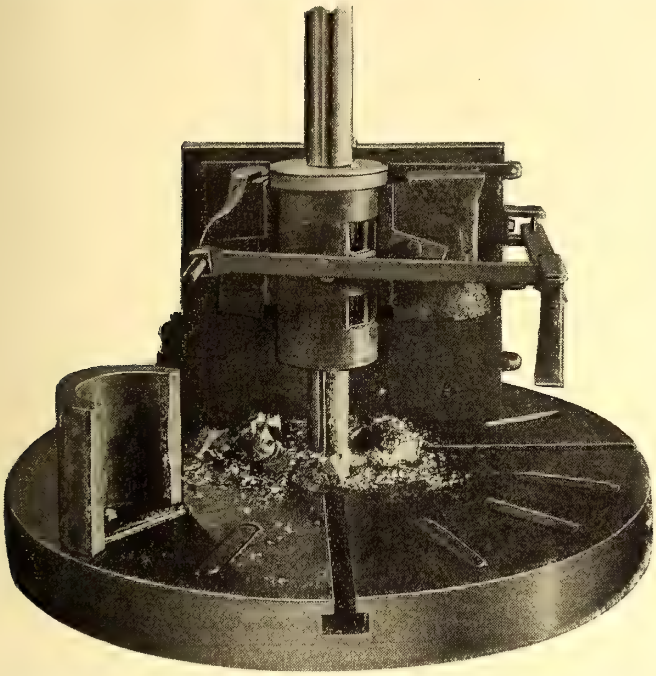


FIG. 3.—JIG AND CUTTER BAR FOR BORING BEARINGS ON A DRILL PRESS

it can be slid from one side to the other of the pit. The car upon which the bearings are to be tested is run so that the armature shaft is immediately over the device, and the head of the upright is placed under the shaft. On moving the lever and raising the armature the amount of play in the bearings can be determined. By placing the head under the collar of the bearings themselves and operating the lever it is easy to

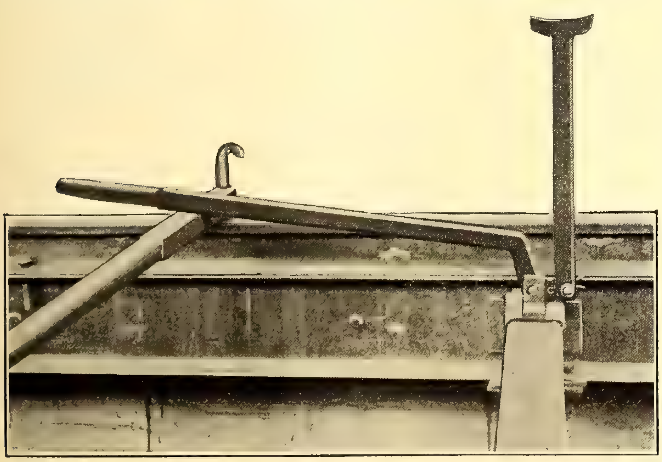


FIG. 4.—APPARATUS FOR TESTING ARMATURE BEARINGS

determine whether or not the bearings are loose in their housings.

The end of the lever of the gage illustrated in Fig. 4 is shown as resting upon a bar with a peculiarly shaped hook on the end. This bar is used to close the lower shell of the motors. The hook is caught in the handle of the shell which is nearest the hinges. The bar passes under the shell and extends out beyond a sufficient distance to give the proper leverage. When the lever is raised and the shell is closed a pit plank placed under the bar holds it in position until a bolt can be inserted. The use of the bar displaces the slower method of raising the lower shell by means of chain falls.

Armature pit jacks of various kinds have frequently been illustrated in these columns, but one of unusual design is employed in Topeka. The jack consists of a wagon mounted on a truck with three wheels. It is intended for use in the pit only, and as the pit has a concrete floor there is no necessity for a track. Armatures are carried to and from the winding room by a cart which is run over the pit. The jack of the armature wagon is raised to receive the armature in the basket at the head. After the jack is lowered, the truck is run under the motor. The armature is then raised to its position in the motor. All lifting of armatures is thereby avoided. The armature wagon is provided with a brake by means of which the wheels may be locked when an armature is being raised or lowered.

PROFIT-SHARING ON FRENCH RAILWAYS

Consul J. C. Covert reports from Lyons that a profit-sharing system has been adopted by the street railways of that French city. The amount distributed will be $500 for each franc (19.3 cents) dividend earned by the company over 35 francs ($6.75) per share. The shares are 500 francs. This year the company earned 40 francs per share. As a consequence $2,500 will go to the employees, two-thirds of the sum to their general relief fund, and one-third to personal relief for sickness. The company also makes other stipulated contributions to the relief funds, the full details of the agreement being on file at the Bureau of Manufactures. The employees bind themselves not to ask for increase in wages for three years. Heretofore there have been frequent strikes.

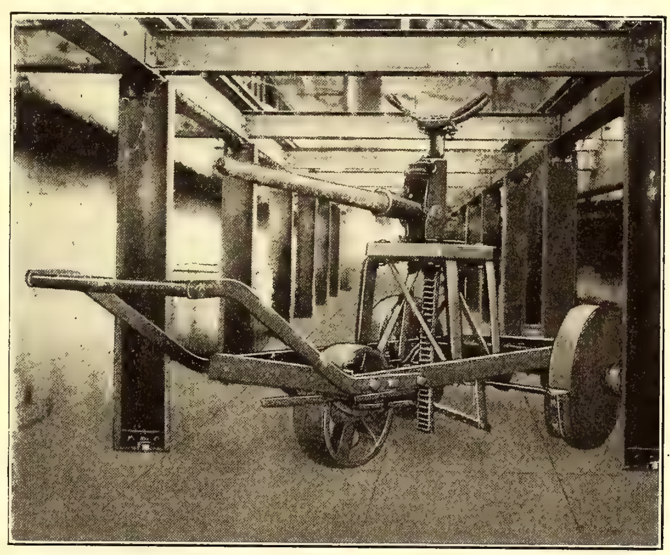


FIG. 5.—WAGON FOR HANDLING ARMATURES IN THE PIT

The Old Colony Street Railway Company has redistricted its system, dividing it into two districts and appointing a superintendent over each, to have absolute control of his territory, in place of the former system of having the whole system looked over by one man, with assistants. John T. Conway, who has been assistant superintendent of the Old Colony system, was appointed superintendent of District 1, which is everything north of turnout No. 4, half-way between Brockton and Taunton and north from Bridgewater Center. George F. Seibel, who has been superintendent, was appointed superintendent of District No. 2, with headquarters in Taunton. The new title gives Mr. Conway official jurisdiction over the Brockton, Quincy and Hyde Park divisions.

A NOVEL WHEEL-HANDLING DEVICE FOR PIT WORK

To facilitate the removal of wheels from trucks, C. M. Feist, master mechanic of the Sioux City Traction Company, Sioux City, Ia., has designed and built the device shown in the illustrations. This tool is mounted on a frame about 14 ft. long, which is provided with wheels and runs on a track built in the pit. A crank provided with a pinion operates a gear wheel by means of a shaft running the full length of the frame. Turning the crank winds up on each end of the shaft a chain attached to a system of levers and raises the carrier on which the wheels are placed. The lever arrangement is of a rather unique design. The arm at each end of the carriage which is pulled down by the chain is bolted to a second arm at an angle of about 135 degs. The framework, which consists of the two arms, is supported by and turns on a rod at the outer end of the second arm. To the other end of this second arm on each side of the machine is hinged a bar, the upper end of which is attached to the carrier supporting the wheels. The carrier is braced laterally by hinged braces underneath. When a pair of wheels is to be changed, the wheels to be removed are run on to a removable section of the track and the truck jacked up to such a height that the wheels clear the removable section. The carriage is then run under the car and the carrier raised by means of the crank until it supports the axle to be taken out. The sections of the track are then allowed to slide outward to clear the wheel and the end of the axle. After the proper bolts have been removed, the carrier is lowered with the wheels and the wheels are turned on the pivoted carriage as shown in Fig. 2, so that they clear the pit timbers. The carriage with the wheels is then pushed out from underneath the car and the wheels, after being raised and turned in the proper position, as shown in Fig. 3, are set upon the track. The new pair of wheels may then be picked up and elevated into position under the car by means of the device.

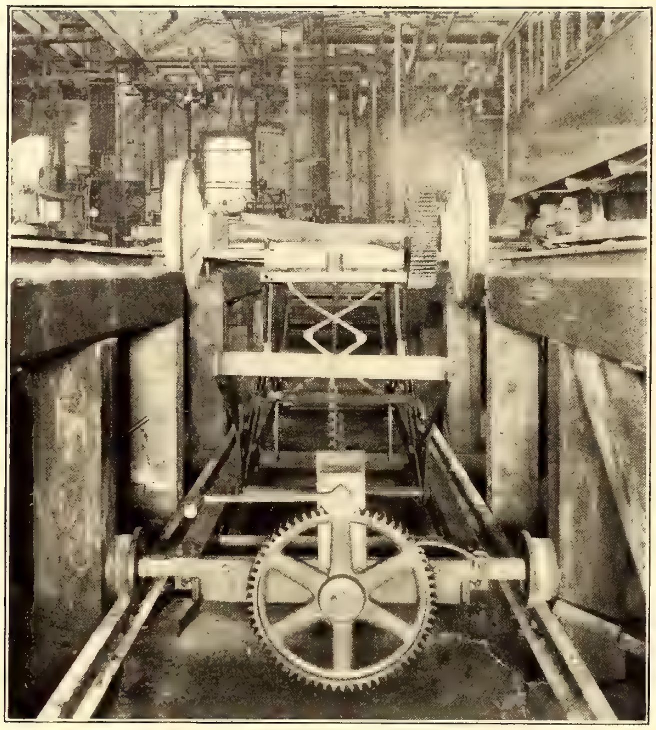


FIG. 1.—WHEEL-HANDLING APPARATUS IN PIT

Danger to the operator is avoided by the fact that he is 7 ft. from the wheels being handled. The gear wheel is provided with a dog, which holds the wheels at any height desired. The movable section of the track has been so built that no bolts are required to hold the short rails in place. They can be removed only by being slid back from the pit, and are ordinarily held in place by a trap door in the floor immediately behind them. The device, Mr. Feist states, has greatly facilitated the removal of wheels, and has well paid for itself in the reduction of the time required to change wheels. The time ordinarily required to drop a pair of wheels, after the necessary truck parts have been removed, and set them on the track ahead of the cars, is about 3 minutes. One feature recommending the device strongly is that a wide range of lift is obtained without any portion of it extending beneath the floor of the pit.

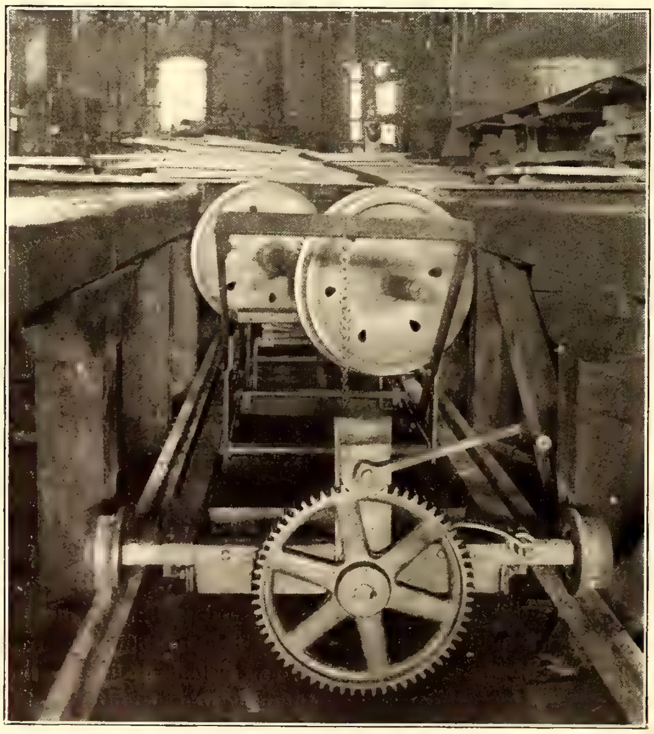


FIG. 2.—WHEELS TURNED ON THE PIVOTED CARRIAGE

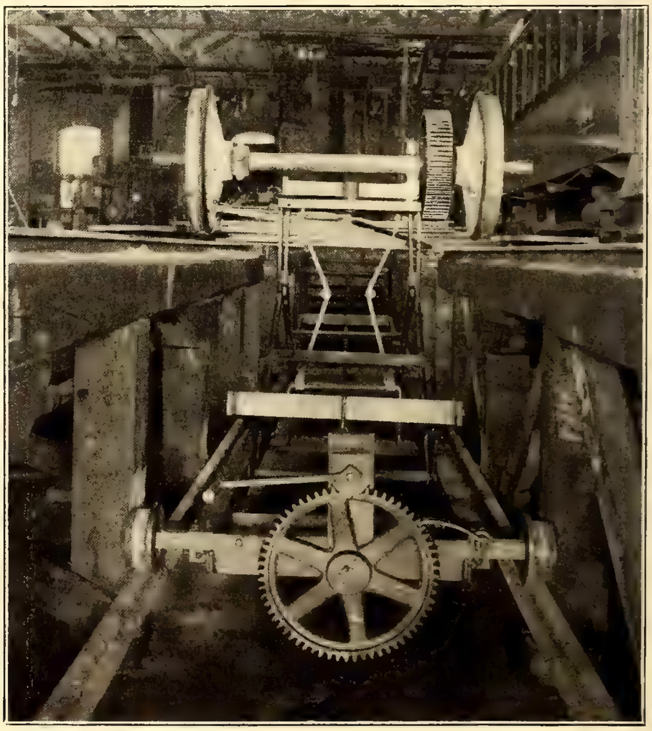


FIG. 3.—WHEELS SET UPON THE TRACK

AN INTERURBAN CAR TEST ON THE BOSTON & WORCESTER STREET RAILWAY

An exhaustive car test for thesis work was performed on the Boston & Worcester Street Railway in April of this year by Messrs. Leroy S. Ford and W. Chester Redding, post graduate students in the department of electrical engineering, Worcester Polytechnic Institute, under the general direction of Prof. A. S. Richey. The tests were unusually successful and conclusive. The only similar tests that have been run in New England were those conducted by the Boston Elevated Railway Company on its lines in January, 1905. Other tests have been run by taking two-second readings, but this method has caused no little confusion, and a large amount of time was consumed in plotting curves and working up results. The continuous semi-autographic method of testing was therefore adopted.

The Boston & Worcester line is doubtless familiar to the readers of this journal as the principal high-speed electric trunk line of New England. It connects the cities named in its title by a forty-mile route, which is covered in regular service in about 2 hours and 15 minutes. The entire line is double tracked with the exception of about 5 miles between Framingham Junction and White's Corner, and this single-track section is now being double tracked by the company's construction forces. As a whole the road contains too many grades and curves conducive to a very high-speed line. There are only five stretches of level track, each about 1000 ft. in length, the longest of these being 1700 ft., located west of Milk Street, Westboro. The road also contains seventeen grades of 5 per cent, seventeen of 6 per cent, eight of 4 per cent, and three of 8½ per cent on the route. Power is generated at a central plant in South Framingham, sub-stations being located at Wellesley, South Framingham and Wellesley Hills. Current is generated at 13,200 volts and delivered to the cars through the usual rotary conversion, at 625 volts.

The car tested was No. 101, a regular closed car of the company. Its length over all was 92 ft. 6 ins., and its seating capacity fifty. The car was equipped with four GE-57 motors, rated at 50 hp each. Each motor weighs 2972 lbs., and the gear ratio was 21 to 64, or 3.04. The car wheels were 34 ins. in diameter. The weight of the car was 25 tons, making, with fifteen operators and instruments, 26.5 tons. About 1000 lbs. of apparatus was used in making the tests. General Electric type-M control was used, and also straight air brakes, the normal reservoir pressure being 80 lbs. per sq. in. Ten runs were made in all, and the motorman and conductor were instructed to handle the car in a manner which would correspond as nearly as possible to an actual service run, keeping to the regular schedule speed. The track was dry and in good condition, with fair weather and an average temperature of 15 deg. C.

The most important results desired were the car motor power consumption per car mile and per ton mile, together with the air-pump motor consumption per car mile, and the consumption of the control system for all the runs; the speed of the car at all points, and the current at all points, voltage of the trolley and that applied to one motor; a brake cylinder pressure record, time and location of observations. Acceleration was calculated from the speed curves. About 300 definite locations were recorded on each run. The record paper was fed from a roll by an electromagnetic notching mechanism driven through relay contacts by one of two sets of six dry cells. One set of cells was allowed to recuperate while the other set was on duty. Indicating instrument readings were in the main followed by operators recording to the disc and pencil method which has now become generally familiar in car tests. A General Electric recording ammeter, time marker clock, Weston magneto for speeds, and voltmeters and ammeters were used, together with two Thomson recording wattmeters, one for total power, and the other for the I^2R losses in the field of No. 3 motor. Two small wattmeters were also used in the central circuit and air motor circuit respectively. The magneto was calibrated from the speed curves of each run by calculating from portions of the curves where the distance traveled was known.

The tests covered a total distance of about 386 miles. The highest speed reached was 56 m. p h., 40 m. p. h. being the highest speed attained on the level under power. The average acceleration on the city service was 1.47 m. p. h. per second, and on interurban runs 1.63 m. p. h. per second. Corresponding values of retardation are 2.12 and 2.77 m. p. h. per second. The calculated temperature rise by resistance for the fields of No. 3 motor was 24 deg. higher than the thermometer readings, showing that the latter values are much lower than the actual temperature of the copper. The control system consumed only 0.66 per cent of the total power. On the whole, the apparatus worked very satisfactorily. At 40 m. p. h. when running on level track the car required 150 amp. at 555 volts.

In the acceleration tests on level track, when it required 18 seconds to reach the last point of the controller, full speed was reached in from 4 to 79 seconds, the distance varying from 0.53 to 0.57 miles. Full speed varied from 34.2 to 37.2 m. p. h., and the power consumption in kw-hours varied from 1.96 to 2.04.

A summary of the power consumption for different sections of the run for the ten tests is given in Table I.

TABLE I., SHOWING POWER CONSUMPTION

		City Hall to Lake Junction	Lake Junction to Westboro Car Barn.	Westboro Car Barn Tremont No. 3. (Fram.)	Tremont No. 3 to Wellesley Car Barn.	Wellesley Car Barn to Chestnut Hill.	Chestnut Hill to Park Square, Boston.
Distance	Eastbd.	3.06m.	5.2 m.	11.39m.	11.35m.	4.22m.	3.83m.
	Westbd.	3.56m.					
Kw-h. per car mile.	Eastbd.	3.69	2.91	2.67	2.30	3.13	2.37
	Westbd.	3.79	3.37	2.94	2.67	2.84	3.87
Watt hrs. per ton mile	Eastbd.	139	109	98	87	118	89
	Westbd.	143	119	111	103	120	127
$\sqrt{\text{mean}^2 I}$ No. 3 motor	Eastbd.	56.9	56.9	52.8	50.0	61,3	51.8
	Westbd.	59.1	64.1	56.3	50.8	58.6	59.1
Average speed m. p. h.	Eastbd.	11.8	25.2	21.3	20.7	20.1	11.6
	Westbd.	12.0	23.0	20.3	20.2	18.3	11.4
Per cent total power, air pump mtr.	Eastbd.	1.91	1.91	0.75	0.94	0.57	1.63
	Westbd.	1.52	0.79	0.87	1.01	2.28	0.91

At Coolidge Avenue, on runs into Boston, the control system is changed for slow running time. On low speed there are only two running points on the controller, namely, four motors in series and two sets of motors in parallel. As the car approaches Boston the trolley voltage becomes much more constant, on account of the greater number of feeders tapped in on the trolley. The kw-hour consumption per car mile is higher on the city section than on the interurban, on account of the schedule speed being too slow for the equipment.

A summary of the stops, brake and power applications for the ten runs is given in table II.:

TABLE II.—SUMMARY OF STOPS

Run No.	Worcester City Hall to Lake Junction.			Lake Junction to Chestnut Hill.			Chestnut Hill to Park Square, Boston.		
	Complete Stops.	Brakes Applied.	Power Applied.	Complete Stops.	Brakes Applied.	Power Applied.	Complete Stops.	Brakes Applied.	Power Applied.
1	14	27	55	40	84	106	14	37	57
2	12	27	43	37	71	103	29	41	55
3	15	32	46	17	74	94	..	..	..
4	4	26	34	26	58	85	..	..	..
5	10	33	38	26	71	103	20	47	53
6	8	23	33	40	77	111	24	41	65
7	7	32	38	24	68	87	..	..	..
8	5	26	39	19	54	83	..	..	..
9	5	34	34	25	83	102	15	36	48
10	4	23	57	27	70	102	10	35	33

Between the Worcester City Hall and Lake Junction, the car under test was operated upon the tracks of the Worcester Consolidated Street Railway Company, and between Chestnut Hill and Park Square upon the system of the Boston Elevated Railway Company. The Boston & Worcester operates over its own tracks for a distance of 31.16 miles.

As a part of a thesis upon "A Study of Train Resistance from Data of Electric Car Tests," Charles H. Gilbert analyzed the Boston & Worcester curves obtained by Messrs. Ford and Redding, tabulating his results between speeds of 21.5 and 39.5 m. p. h. These average values were as follows:

Miles per hour	21.5	29.	32.5	35.	36.	37.5	39.5
Lbs. per ton	13.3	19.15	22.16	22.9	21.5	21.6	21.

Mr. Gilbert pointed out that from the tables of results drawn from the Boston & Worcester car runs it may seem as if the values of train resistance were very erratic for the same speeds. A large number of factors enter the problem, and the grades in particular are a very important feature of the calculations. Even a slight mistake in the plotting of these on the run sheets would make considerable difference in the value of train resistance, as the power required for a 1 per cent grade is 20 lbs. per ton. The very variable alignment and grade of the Boston & Worcester made it especially difficult to secure the fixed conditions necessary to accurate results. Figures of closer consistency were secured by Mr. Gilbert in analyzing a large number of car runs upon the system of the Indiana Union Traction Company.

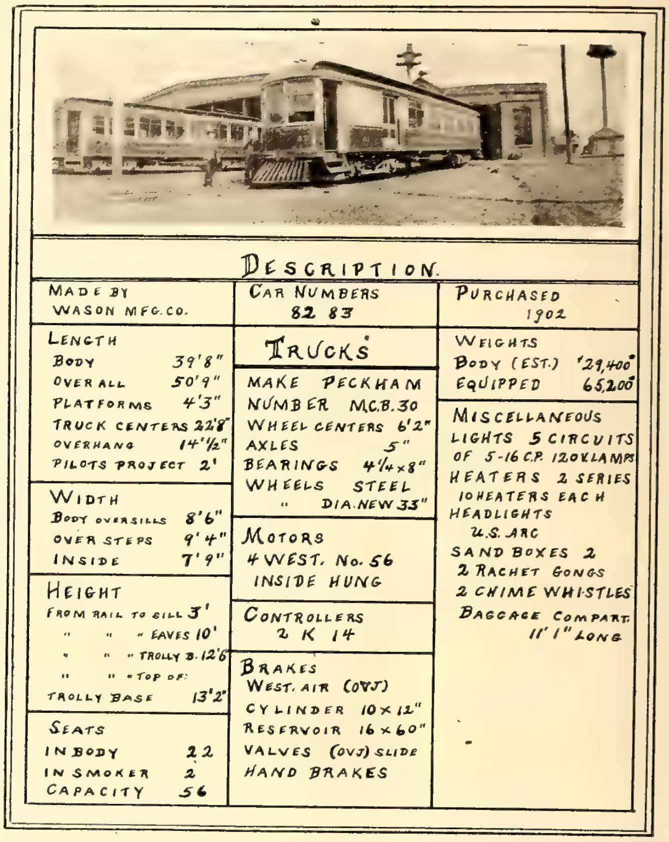
KEEPING CAR RECORDS

If a road has a number of different types of rolling stock, it becomes desirable to keep descriptions of each type of car in some form for quick reference so when information is wanted concerning the measurements, type or appearance of any particular car the data can be readily furnished without looking up the original plans.

A correspondent submits a method for keeping these data that it is believed offers a satisfactory means not only of filing in convenient shape descriptions of the rolling stock, but also of showing at a glance "what the car looks like."

The scheme is to keep blue print sheets for each type of equipment in the form shown herewith. The sheets are 8¼ ins. x 10½ ins. It will be noticed each sheet contains a condensed description of the car, but the new feature of the suggestion consists in placing at the top of the sheet a blue-print photograph of the particular equipment. This photograph is not pasted onto the sheet, as it is believed the record becomes too bulky if the actual photographic prints are attached to the sheets. The method of getting the prints on the records is as follows. The descriptions as shown are first made out on tracing cloth, and a space is then cut from the tracing at the top of sufficient size to accommodate the picture. The photographs are taken on film negatives, preferably with a panorama kodak (to get the full length). After the film is developed, the film itself is pasted into the open space on the tracing and a blue print is then made of the tracing and film at one operation, giving the complete descriptive and photographic record on one sheet. It required considerable experimenting to get just the right development in the films for this purpose, as very dark film, or a film too light, will not make a satisfactory blue-print picture. The best results are secured when the film is a trifle undeveloped; that is, it is taken out of the bath before it is as dark as would be required for an ordinary solio or velox print.

The same correspondent also suggests the importance of keeping "individual car records" showing separate accounts of the maintenance expenses of each car, and each part of the car. For this purpose he enters the individual records on a sheet which is divided into fourteen sections as follows: One section for each of the four motors; one section for each of


DESCRIPTION.

MADE BY
WASON MFG. CO.

CAR NUMBERS
82 83

PURCHASED
1902

LENGTH
BODY 39'8"
OVER ALL 50'9"
PLATFORMS 4'3"
TRUCK CENTERS 22'8"
OVERHANG 14'½"
PILOTS PROJECT 2'

TRUCKS
MAKE PECKHAM
NUMBER M.C.B. 30
WHEEL CENTERS 6'2"
AXLES 5"
BEARINGS 4¼ x 8"
WHEELS STEEL
" DIA. NEW 33"

WEIGHTS
BODY (EST.) 29,400
EQUIPPED 65,200

MISCELLANEOUS
LIGHTS 5 CIRCUITS OF 5-16 C.P. 120 V. LAMPS
HEATERS 2 SERIES 10 HEATERS EACH
HEADLIGHTS U.S. ARC
SAND BOXES 2
2 RACHET GONGS
2 CHIME WHISTLES
BAGGAGE COMPART. 11'1" LONG

WIDTH
BODY OVERSILLS 8'6"
OVER STEPS 9'4"
INSIDE 7'9"

MOTORS
4 WEST. No. 56
INSIDE HUNG

HEIGHT
FROM RAIL TO SILL 3'
" " " EAVES 10'
" " " TROLLY B. 12'6"
" " " TOP OF TROLLY BASE 13'2"

CONTROLLERS
2 K 14

BRAKES
WEST. AIR (OVJ)
CYLINDER 10 x 12"
RESERVOIR 16 x 60"
VALVES (OVJ) SLIDE
HAND BRAKES

SEATS
IN BODY 22
IN SMOKER 2
CAPACITY 56

SAMPLE SHEET, SHOWING METHOD OF KEEPING CAR DATA

the two trucks; two sections for controllers, and one section for each of the additional items, brakes, body, trolleys, miscellaneous mileage and totals.

For a year's record the same blanks can be used, and the totals for each month of the year entered thereon, thus giving the cost for each particular part of a car for the entire year. Although this takes considerable labor and for a large road would occupy the time of one clerk, it gives the management an accurate idea of the cost of every car on the line, and is believed to be of sufficient value to warrant the expense.

It is a well-known fact that no two cars "stand up" under ordinary service exactly alike, even though they are built and equipped in duplicate. This may be due in some measure to the men who operate the cars, but it very frequently happens that it is due to some defect in the equipment which is not easily located. In such cases the record referred to will show weak places, as the maintenance items, repeated several months in succession and covering the same part of the car, will naturally lead to investigations as to the particular cause of the high figures.

The Detroit, Monroe & Toledo Short Line, acting in conjunction with the Detroit United Railways, has commenced the operation of through limited trains from Toledo to Mt. Clemens, Mich., by way of Detroit. Some very fine new cars have been ordered for this service. The double tracking of the Short Line is being pushed and will be completed this year. It will be the first double-track line in the district.

TRUCKS FOR THE HUDSON COMPANIES' CARS

The American Locomotive Company is preparing designs for fifty motor and fifty trailer trucks ordered from it by the Hudson Companies. The preliminary specifications from which the designs are being made were prepared by L. B. Stillwell, consulting engineer of the Hudson Companies, having this matter in charge, and the designs of these trucks will be made in consultation with him. Each motor truck is designed to carry two General Electric Company's No. 76 motors. The motor suspension will be of the nose type, and a motor will be geared to one wheel on each axle, the wheel hub being extended to take the gear for the motor. Both motor and trailer trucks will be of the bar frame swinging bolster type. The bolsters of rolled steel float between transoms of channel iron with freedom to move vertically, and are suspended by four three-point (or stable equilibrium) hangers. The long three-point hangers allow the bolsters a good lateral motion and utilize the weight of the trucks to restore the hangers to their proper position without the use of springs. In this way that pendulum motion of the car body which is so distressing to passengers is eliminated. The trucks will be very similar in design to those built by the American Locomotive Company for the Schenectady Railway Company which have been so satisfactory. The specifications for the trucks are as follows:

MOTOR TRUCKS

Gage of track, 4 ft. 8½ ins.
Wheel base, 6 ft. 6 ins.
Length over all, 10 ft. 6½ ins.
Transverse center of frame, 6 ft. 4 ins.
Load carried at center plate, total, 28,000 lbs.
Weight of truck without motor, about 10,500 lbs.
Wheels, 34¼ ins.
Journal bearings, 5 ins. x 9½ ins.
Transoms, 10-in. channel iron.
Bolsters, rolled steel.
Frames, wrought iron.

TRAILER TRUCKS

Gage of track, 4 ft. 8½ ins.
Wheel base, 5 ft. 6 ins.
Length over all, 8 ft. 5 ins.
Transverse centers of frames, 6 ft. 4 ins.
Load carried at center plate, 28,000 lbs.
Weight of truck, about 9000 lbs.
Wheels, 30 ins.
Journal bearings, 4¼ ins. x 9½ ins.
Frames, wrought iron.
Transoms, 9-in. channel iron.
Bolsters, rolled steel.

STANDARDIZATION OF BRAKE SHOES BY THE AMERICAN STREET & INTERURBAN ENGINEERING ASSOCIATION

The committee on standardization of the American Street & Interurban Engineering Association has issued a circular on the subject of brake shoes, upon which data are desired. The circular is being sent to all members of the association by Secretary Swenson, to whom replies should be directed. The circular states that committees from both the "American" and the "Engineering" Associations were appointed at the 1905 conventions to investigate the general problem of standardization and to undertake such work of this nature as might be considered advisable at the present time.

The active work of making the standards devolves upon the Engineering Association committee. This committee has decided to devote its attention at present to the standardization of brake shoes, journals and journal boxes, tread and flange wheels, and rails for street and interurban railways. Considerable work has been done along all four lines of standardization, but the present communication relates only to the subject of brake shoes. The information secured from the data sheet will be carefully collated by the engineering committee, and, together with other material upon this subject, will form the basis of the report of this committee on the standardization of brake shoes. The letter is signed by H. Wallerstedt, chairman; H. A. Benedict, W. H. Evans, H. B. Fleming, J. M. Larned, F. H. Lincoln and Paul Winsor, members of the Engineering Association committee on standardization.

The data sheet follows:

American Street and Interurban Railway Association
60 Wall Street, New York

Office of the Secretary

American Street and Interurban Railway Engineering Association

Committee on Standardization
Brake Shoes

Data Sheet No. 9. July, 1906.

1. Company ....
2. City ....(3) State ....
4. Diameter of Wheels:
 Motor Trucks.
 On motor axle (a) New....................(b) Worn out....................
 On pony axle (a) New....................(b) Worn out....................
 Trailer Trucks.
 (a) New ....(b) Worn out ....
 (Give outline sketch with dimensions of wheel tread and flange.)
5. Brake Shoes:
 Average Weight.
 Flanged (a) When new....................(b) When removed....................
 Unflanged (a) When new....................(b) When removed....................
 Combined Head and Shoe, Flanged (a) When new....................
 Combined Head and Shoe, Flanged (b) When removed....................
 Combined Head and Shoe, Unflanged (a) When new....................
 Combined Head and Shoe, Unflanged (b) When removed....................
 Percentage Scrap.
 Flanged ....Unflanged ....
 Combined Head and Shoe, Flanged....................
 Combined Head and Shoe, Unflanged....................
 Outline Sketch. Give outline sketch or blue print showing full sized dimensions of combined brake-shoe and head. If separate, show sketches with dimensions for both brake-shoe and head. If key is used, give separate sketch of key, with dimensions.
 Dimensions (in inches).
 (a) Length....................(b) Width (over all) Flanged....................
 (c) Width (over all) Unflanged......(d) Depth of groove in Flange......
 (e) Thickness when new....................
 (f) Maximum thickness that clearances will permit on new wheel—
 (1) Inside hung ....(2) Outside hung....................
 Manner of Hanging.
 Motor Trucks (a) Inside hung....................(b) Outside hung....................
 Trailer Trucks (a) Inside hung....................(b) Outside hung....................
6. Brake Head:
 Kind of Metal (a) Motor Trucks....................(b) Trailer Trucks....................
7. Suggested Standard. Kindly send dimensioned sketch showing what you consider would be a good standard form of brake-shoe and head.
 Remarks. Kindly put additional data and suggestions on a separate sheet and attach it to the data sheet.
 Signed ....
 Title ....

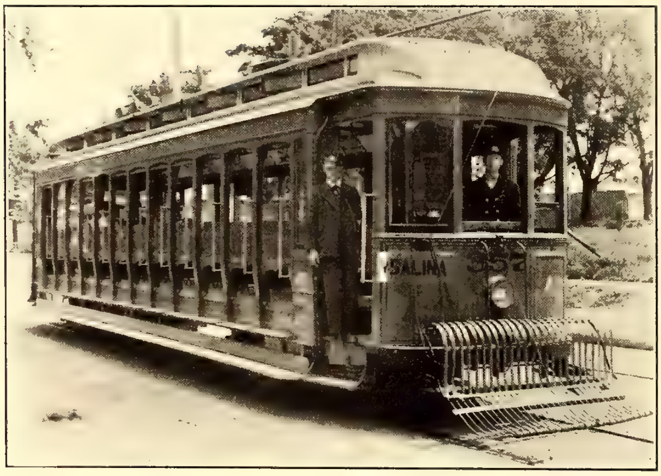
Notice.—This information blank is sent you in duplicate form. Please fill in the information asked for at your earliest convenience, and return one copy to Bernard V. Swenson, secretary, American Street & Interurban Railway Association, 60 Wall Street, New York City. You will receive a bulletin later announcing the results of this investigation.

TROLLEY BASEBALL LEAGUE FOR WESTERN OHIO

The Western Ohio Railway Company is taking an active interest in the promotion of a trolley baseball league to include teams in Lima, Findlay, Wapakoneta, St. Marys, Delphos, Piqua and Sidney. All the towns mentioned are located on the company's system, and the company has agreed to furnish free transportation which will permit the players to return to their home city nightly if they desire. It is the intention to have a fall circuit, and many of the games will be played in connection with the circuit of county fairs operated in these towns each year.

NEW FORM OF CONVERTIBLE CAR FOR SYRACUSE

The type of car adopted last year by the Cleveland Electric Company, after much experimenting, has caused a great deal of interest on account of its embodying a number of features differing radically from standard practice. It has evidently met the requirements in Cleveland, as a second lot of fifty cars has lately been put on the lines. Within the last few weeks the Syracuse Rapid Transit Company has put in operation ten cars nearly identical in design and dimensions. The cars were built by the G. C. Kuhlman Car Company, of Cleveland, under the Brill patents. They are convertible on one side only, as they are intended for operation



CONVERTIBLE CAR FOR SUMMER SERVICE

in one direction. The Brill Company has designed and built a number of styles of cars with the convertible system on one side only, but the type built for Cleveland and Syracuse seems to be the most successful form, for the reason that it includes a seating arrangement which is a combination of the longitudinal and transverse seats. The left side of the car, or the side opposite that which has the sliding sashes and panels, has the standard type of built-in panels and drop-window sashes; against this side are placed longitudinal seats in sections accommodating three passengers each. The distance between the ends of the transverse seats and the cushions of the longitudinal seats is 33 ins.; in other words, there is a gain of about 15 ins. over the aisle width of a car with transverse seats on both sides.

When the convertible side is opened, the longitudinal seats are swung around into line with the transverse seats and securely connected thereto, forming continuous seats across the car and accommodating five passengers each. The seating capacity when the car is opened is 65 passengers. This includes seats across the doors at the ends. The convertible feature is of the "grooveless-post" type, which has frequently been described in these pages, and includes a modification of the "Narragansett" type of sill step. The arrangement is somewhat different from that which was described in an article on the Cleveland type of car in the Street Railway Journal of July 1, 1905. Instead of the step treads being composed of metal plates screwed to the flange of the Z-bar sill and nearly all within the line of the posts, as heretofore, the new arrangement consists of step treads which fold up individually and on which the panels in their lowered position rest; this arrangement does away with the necessity of cover plates for the step openings when the car is closed, such as were formerly used, and although devised entirely for utility, adds much to the appearance of the car, especially when closed, as will be seen in the illustration. The curtains may be drawn entirely to the floor if needed for protection during stormy weather, and as the windows on the opposite side are always available for use, the interior is well lighted; therefore on rainy days it is as comfortable as a closed car.

Attention is directed to a novel feature of these cars, which consists of a water board placed longitudinally along the side roof on the convertible or entrance side, including the part of the roof which extends over the platforms. One of the pipes which carries off the water from the trough formed by the water board is placed beside the body corner post at the forward end of the car and is utilized as a grab handle, the other pipe at the rear of the car is utilized as a hood support. The vestibule at the forward end has no doors at the platform step, but has a partition with sliding door extending diagonally across the platform from the vestibule corner post to the body door post at the center of the body end. This door at the body end is of the "semi-accelerator" type, and the door at the rear end is of the same style; these doors are set close to the platform steps, facilitating ingress and egress. The suitability of this arrangement will also be readily understood in connection with the form of vestibule at the front end and the "Detroit" platform at the rear. The grab handles on the side posts will be seen in the illustration to be turned backward, for the reason that a passenger leaving the car will only see the one at the left, and therefore is made to face forward, an arrangement which should largely obviate one of the commonest causes of accidents.

The dimensions are as follows: Length over the end panels, 35 ft. 6 ins., and over the vestibules, 45 ft.; from the end panels over the vestibule (front end), 4 ft., and at rear end, 5 ft.; width over the sills, including the plates, 7 ft. 11¼ ins. The width over the posts at the belt is 8 ft. 2¾ ins.; the height from the floor to the ceiling is 8 ft. 6¼ ins., and from the track over the trolley board 12 ft.; the sweep of the posts is 1¾ ins., and the distance between the centers of the posts 2 ft. 9 ins.; the thickness of the corner posts is 3⅝ ins., and of the side posts 2¾ ins. on the closed side and 3⅜ ins. on the convertible side. The side sills are 4¾ ins. x 7¾ ins. on the closed side and 2½ ins. x 7¾ ins. on the convertible side. The end sills are 4¾ ins. x 7¾ ins. The sill plates on the closed side are 8 ins. x ⅝ in. on the sill angle iron; on the convertible side, 8 ins. x 6 ins. x ⅞

SYRACUSE CONVERTIBLE CAR, CLOSED

ins. The length of the seats on the convertible side is 36 ins., and of the movable seats 53 ins. The type of truck is the No. 27-G, and the weight of car body is about 21,000 lbs., and of the car and trucks, without the motors, about 33,000 lbs.

The cars will be used on the main line in the city of Syra-

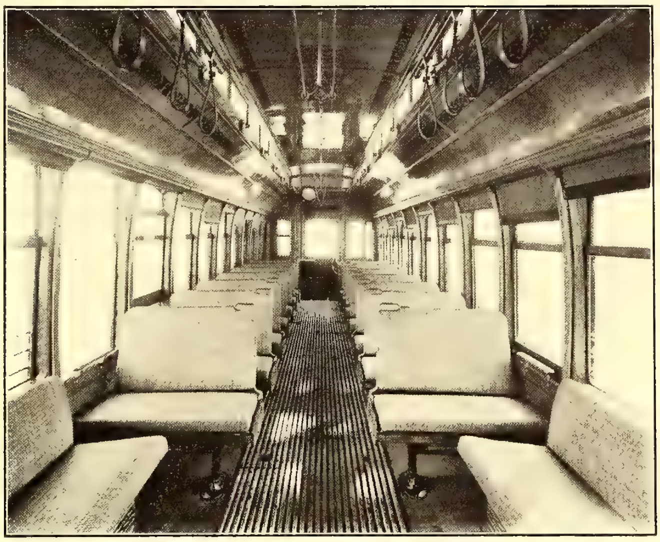
cuse, running from the northern extremity of the city across town to Onondaga Valley, where the company's summer theater is located, a distance approximately of 6½ miles. This is a line of very heavy travel, and a five-minute service is maintained throughout the day; in the evening cars are run to the resort every two and one-half minutes.

SEMI-CONVERTIBLES FOR VALLEY TRACTION COMPANY

The car shown in the illustration is one of a number of Brill grooveless post semi-convertible cars that have recently been shipped to the Valley Traction Company. The Valley Traction Company operates about 40 miles of electric street railway system, having an entrance via the Peoples Bridge into Harrisburg, Pa., and running through the suburban district in Cumberland County on the west side of the Susquehanna River. The lines run through Wormleysburg, Fairview and Enola, reaching Marysville, 9 miles north; Lemoyne, White Hill and New Cumberland, 3 miles south, and Carlisle, 19 miles west of Harrisburg; the line to Carlisle paralleling the Cumberland Valley Railroad and passing through the residence districts of Camp Hill, Shiremanstown, Mechanicsburg, and an attractive picnic ground and park at Boiling Springs, about 5 miles east of Carlisle. All-day hourly service is operated to the extremities of the Marysville and Carlisle lines, with half-hour service all day to the nearer intermediate points, but to the farther ones during the denser traffic of the morning and evening hours only. An all-night hourly service is maintained between Harrisburg and the freight terminal of the Pennsylvania Railroad at Enola, about 4½ miles north of Harrisburg. The company operates twenty-eight cars, of which thirteen, including those which have just been delivered, are double-track cars with four-motor equipments, mainly of 40 hp. The lines run through an attractive and populous country, and for 11¾ miles are built on private right of way, few grade crossings of steam or other electric roads being encountered, the only ones being four with the C. V. R. R. and one with the G. & H. R. R. in the borough of Carlisle, and one on the Dillsburg branch of the C. V. R. R., for all six of which safety derailing devices are provided. The cars are operated with 550 volts direct current furnished by steam-power plants at Lemoyne, which is situated just across the Susquehanna River from Harrisburg, and at Carlisle. This summer it is intended to close down the steam plant at Carlisle and operate the road by means of rotary converter sub-stations, one in the present power plant at Carlisle and the other in a new building now being erected west of Mechanicsburg, about 9 miles from Harrisburg, these sub-stations being fed with three-phase, 25-cycle alternating current of 13,200 volts, generated in the main station at Lemoyne.

DOUBLE-TRUCK, VESTIBULED CARS FOR THE VALLEY TRACTION COMPANY

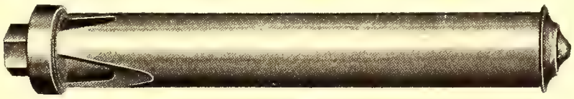
A feature of these attractive-looking cars is the generous length of platform provided, namely, 6 ft. The cars will seat forty-four passengers, the longitudinal seats at each corner of the car accommodating four persons each, and behind which are three-bar window guards, which is a good feature if somewhat unusual. All three sashes in the vestibules are arranged to drop into pockets. The interiors are finished in ash with ceilings of birch, decorated. Numerous of the car maker's specialties are employed throughout the car, namely, alarm gongs and signal bells, sand boxes, step fenders closing the entire opening in the back of the steps, and channel iron radial drawbars. The chief dimensions of the car are as follows: Length over the vestibules, 42 ft. 8 ins, and over the end panels 30 ft. 8 ins.; width over the sills, including the sheathing, 8 ft. 4 ins.; centers of the posts, 2 ft. 8 ins.; height from rail over the trolley boards, 11 ft. 11⅝ ins.; size of side sills, 4 ins. x 7¾ ins.; size of end sills, 5¼ ins. x 6⅞ ins.. The No. 27-G1 is the type of truck used, having a wheel base of 4 ft. Four motors are used per car.



LONGITUDINAL SEATING AT END OF VALLEY TRACTION COMPANY'S CARS

DEEP-TONED AIR WHISTLE

Considerable annoyance has been caused both passengers and dwellers in suburban towns by the shriek of the ordinary air whistle used on interurban cars. A new whistle designed on organ-pipe principles has recently been placed on the market by the General Electric Company which does away with this trouble.



ORGAN TIMBRE AIR WHISTLE

Heretofore air whistles have been designed along the same lines as a steam-blown whistle. It is well known that steam whistles operated by air give a very different tone, the cause being due in part to the condensation of the steam as it issues from a restricted orifice, which increases its density. No such condition exists with air, so that the tone of an air-blown steam whistle is harsh and shrill. The whistle manufactured by the General Electric Company is designed with center partitions located so as to prevent a transverse flow of air across the ports, which would tend to distort the effective column of air. The tone is deep, clear and agreeable, and can be heard at a considerable distance.

Aside from the agreeable tone given by the new whistle, the operating details are carefully worked out. It is substantially constructed of non-corroding metal, and should last indefinitely. The standard whistle operates most efficiently at an average air pressure of 55 lbs. per sq. in. It operates satisfactorily, however, on pressures varying from 50 to 130 lbs. per sq. in. A convenient operating valve of the adjustable lever type is used with this whistle.

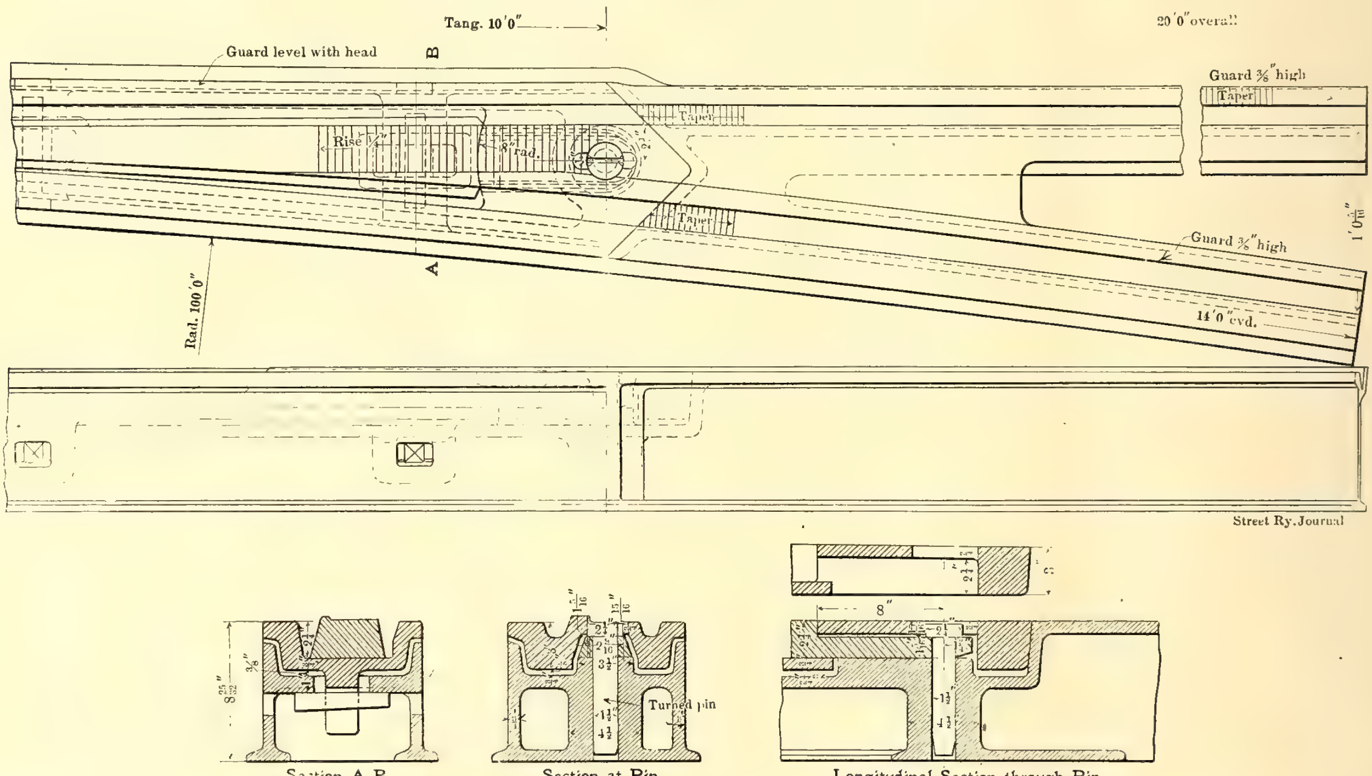
NEW PROTECTED HEEL SWITCH

A new type of protected heel switch has recently been invented by Ernest B. Prior, roadmaster of surface lines of the Brooklyn Heights Railroad Company, and has been put in service in a number of different places on the Brooklyn Rapid Transit System. As is well known, in the ordinary type of switch it is customary to employ a plate separate from the rest of the structure and secured thereto over the heel portion of the tongue, and this plate must be removed to take out the tongue. Some difficulty has also been found in securing these plates rigidly in the structure and with their track surfaces in alignment with the adjoining track surfaces.

In the Prior switch the heel is protected by an integral portion of the structure, which, together with the tongue and its pin, is so constructed and arranged that the tongue may be readily removed. The accompanying engraving shows a plan of the switch, side elevation, sections on lines *AB* and through the pin, and a longitudinal section through the heel portion of the switch. As will be seen, the bed plate, which is of guaranteed steel, is cast with a pocket 8 ins. long measured to the center of the pin, and into this pocket the heel of the tongue fits. The pin is 1½ ins. in diameter, extends through the heel of the tongue in the pocket, and its head is protected from wear by the guaranteed steel of the bed plate, as shown in the longitudinal section through the pin. The bed plate is attached to the switch casting by pins and spelter in the usual way. The tongue can be readily removed by raising the pin, and slipped out. It can be as quickly replaced.

Of these switches nine are now in use on the lines of the Brooklyn Heights Railroad Company. One of them has been in service for two years at Flushing and Morgan Avenues, and during this time no complaints have been received about its being out of order and no repairs have been made to it. At Sands Street and the south roadway of the Brooklyn Bridge, one of the busiest locations on the system, eight more have been recently installed.

All of these switches were made by the Lorain Steel Company under the Prior patents.



CONSTRUCTION DETAILS OF PROTECTED HEEL SWITCH USED IN BROOKLYN

WASHINGTON EMPLOYEES' OUTING

The annual outing of the Washington Railway & Electric Company's Employees' Relief Association, of Washington, D. C., was given June 30 at River View. Ten thousand members, their friends and relatives, attended, and the steamers Queen Anne, Arrowsmith, St. Johns, Harry Randall and Wakefield each made several trips to the resort. Amusements were provided in plenty, and the entertainment committee had arranged many athletic events. Valuable prizes were given in each. In the afternoon a baseball game was played between the Columbias and Mechanics, which was called in the fourth inning because of darkness. The score was 5 to 4 in favor of the Columbia. The evening was devoted to dancing and cake walking.

The Ft. Wayne, Van Wert & Lima Traction Company has received from the Cincinnati Car Company two new parlor buffet cars, the "Van Wert" and "Lima," for limited service between Lima and Ft. Wayne. These cars are 65 ft. long and are duplicates of the cars for the Ft. Wayne & Wabash Valley system which were described and illustrated in the Street Railway Journal of June 16. Cars of similar char acter are also being built for the Lima & Toledo Traction Company for limited service between Lima and Toledo.

FINANCIAL INTELLIGENCE

WALL STREET, July 25, 1906.

The Money Market

The money market has worked somewhat easier during the past week, the principal influences being the extremely heavy gain in cash by the New York clearing house banks and the falling off in the demand for funds from stock commission houses. Heretofore short-time money has been firmly held around 4½ per cent, but during the past week sixty and ninety-day maturities have been freely offered at ½ per cent below that rate without takers. The demand is principally for the over-the-year period, and while concessions are looked for, bankers generally continue to hold the market firm at 5½ per cent. It is understood that many of the large stock houses have taken on ample supplies of long-time money, but in some quarters there still exists a disposition to hold off for lower rates. The general opinion seems to be, however, that there will be no appreciable decline in the rate for six months' money in the near future. One of the most favorable developments of the week was the successful flotation of the $30,000,000 2 per cent Panama Canal bonds. There were 2970 separate bids for the issue, aggregating $445,000,000, and the average price was a trifle better than 104. This transaction was made without the slightest disturbance in the money market, the announcement being made by the Secretary of the Treasury that he would deposit about $25,000,000 of the proceeds with the national banks. Gold imports for the week amounted to $450,000, all of which was engaged in the Australian market. The importation of gold from the European markets has been temporarily arrested by an advance of 75 points in the price of sterling exchange. The European markets have been unsettled, owing to the disturbances throughout Russia, and rates for both money and discount have shown a tendency to harden at the principal centers. The bank statement published on last Saturday was highly satisfactory, inasmuch as it showed a gain in cash of $11,762,000, which was considerably larger than indicated by the preliminary figures. Loans expanded $9,435,300, and deposits were $20,807,200 larger than in the preceding week, thus increasing the reserve required by $5,201,800. The surplus, therefore, was increased by $6,561,200. The total surplus now stands at $19,391,000, and compares very favorably with the surplus reserves held by the New York banks in the corresponding periods of previous years. In the corresponding week of 1905 the surplus was $14,949,950, against $50,609,600 in 1904, $18,915,400 in 1903, $15,502,400 in 1902, $23,128,575 in 1901, and $24,081,900 in 1900.

Money on call during the week has loaned at 3 and 2 per cent, the average being about 2½ per cent. Time money for the short dates ruled decidedly easier, sixty-day and ninety-day contracts being offered freely at 4 per cent and at 4½ per cent respectively. Four months' money was obtainable at 5 per cent, five months' at 5¼ per cent, and six months' at 5½ per cent. Mercantile paper has remained quiet and unchanged at 5 and 5½ per cent for the best double names.

The Stock Market

The sentiment has undergone a rather favorable change so far as the securities market is concerned, and while indications of this improvement were noticeable in the early part of the month, they did not take practical shape until this week, when a heavy buying movement set in and carried prices up in a very substantial manner, the gains on the active stocks ranging anywhere from 2 to 9 points. Heretofore the market has been restricted by uncertainty regarding the monetary outlook, and by the disturbing possibilities of the Russian situation. As a matter of fact the market has been under unfavorable influences since the culmination of the bull movement in January, and while occasional rallies occurred these were followed by another selling movement and lower prices. The result was the creation of a pessimistic sentiment, liquidation of all weakly-held stocks, and the bringing into existence of a very substantial short interest. The banking interests and the more important operators were apparently indifferent to what the market was doing, and it was not until some very unfavorable rumors affecting the standing of a prominent London banking house that they came into the market and gave it aggressive support. This was followed by further buying, and on Monday when the Russian news was bad the large interests took control of the situation, and by forced short covering and some aggressive buying carried prices up sharply. This eliminated a large part of the floating short interest, and with the recurrence of unfavorable Russian advices the market suffered severe reaction. The very favorable bank statement of last Saturday was a direct influence in bringing about a better feeling, as was also the announcement that the Secretary of the Treasury had deposited $25,000,000 in the national banks as an offset to the withdrawals in connection with the Panama Canal bond issue. The heavy bidding for these bonds was one of the encouraging features for the week, and indicated that investors are willing to take good securities. The features have been the Harriman stocks, in which the buying has been exceptionally good and apparently from inside sources. The upward movement in Southern Pacific has been stimulated by persistent rumors that early and favorable action will be taken regarding dividends on the common stock, and it is also intimated that the directors may issue more preferred stock, which would give valuable rights to holders of the common. The Copper shares were advanced sharply on buying credited to important interests, and on reports of further favorable developments in connection with these properties. There was very good buying for both accounts of the anthracite coal stocks, especially of Reading. The Steel stocks ruled quiet until about the middle of the week, when there was a sharp advance in the preferred, with good buying of the common. The sharp gains in the Hill stocks was due to the belief that the return of Mr. Hill to New York will be followed by the consummation of the deal for the lease of the Great Northern ore lands to the Steel Corporation.

The local traction stocks were comparatively quiet, but they advanced materially until near the close, when a sharp break in Brooklyn Rapid Transit took place, on what appeared to be aggressive speculative selling. Aside from the agitation for a 5-cent fare on the Brooklyn Rapid Transit lines, all the conditions in connection with these properties are favorable to higher prices for them. It is expected that the Brooklyn Rapid Transit report will show a very substantial surplus for the stock.

Philadelphia

There has been a decided improvement in the local traction issues during the past week. The number of issues traded in has been comparatively small, but the individual transactions were considerably larger than in the previous week, and prices generally displayed strength. Philadelphia Rapid Transit was again the most active feature, about 6000 shares changing hands at from 29 to 31 and back to 30¾, a net gain for the week of 1½ points. Philadelphia Traction was unusually active, nearly 1000 shares changing hands from 98½ to 99. Union Traction rose from 63 to 63½, on the purchase of 1300 shares. Philadelphia Company common, after declining to 47¾, advanced to 49½, and closed at the highest, while small lots of the preferred sold at 50¼ and 50⅜. United Companies of New Jersey changed hands at 255½ to 254, a loss of 4 points. American Railways sold at 51½.

Baltimore

Trading in the traction issues at Baltimore has been broader, but it has been attended with a very irregular price movement. United Railway issues furnished the overshadowing features, both in point of activity and price fluctuations. At the beginning these issues showed strength on the announcement that the Income Bondholders' Association had accepted the company's plan for refinancing the company, but subsequently there was rather heavy selling, especially of the stocks and the income bonds. The free stock sold from 16⅞ down to 16, with a subsequent rally to 16½, about 1800 shares changing hands, while the pooled stocks sold from 17 to 16¼, and closed near the lowest, on transactions of about 1500 shares. The income bonds opened at 74¾ and advanced to 75, but later broke to 73, on dealings aggregating $230,000. The certificates representing income bonds deposited were comparatively quiet, about $40,000 selling at from 73¼ to 72⅞. The 4 per cent bonds were quiet but firm, with sales at 92 and 92¼. Norfolk Railway & Light 5s sold at 99¼ for $15,000, and $11,000 Lexington Street Railway 5s sold at 101⅝ and 101¾. Memphis Street Railway 5s changed hands at 102¾ for $20,000.

Other Traction Securities

The Chicago market has remained quiet during the past week, and prices generally showed very little change. Metropolitan Elevated advanced from 26½ to 28, on renewed talk of a merger of the various elevated lines. South Side "L" held steady at 95⅝, and the 4½ per cent bonds sold at 102¼. Northwestern Elevated 4s sold at 91, and North Chicago brought 34 for an odd lot, and sales of West Chicago were recorded at 25. The Boston market was more active and generally strong, the feature being an advance of a point in Boston Elevated to 153 on light purchases. Massachusetts Electric issues were quiet but firm, the common selling at 19 and the preferred at 69 and 68¾. Other transactions included Boston & Suburban common at 20, Boston & Worcester common at 27, the preferred from 80 to 77, and back to 79, West End common at 96 and 95¾, and the preferred at 110.

Cincinnati Street Railway was rather active in Cincinnati last week, several lots selling at 143½ to 143. Cincinnati, Newport & Covington common advanced fractionally to 73¼. Toledo Railways & Light advanced from 32¾ to 33½, on news of a fine report for last month. Cleveland Electric continues the active feature in Cleveland. It went up to 75 on the announcement of a definite proposition to the city, and then dropped to 73½ on news of the proposition made by the low-fare company. Northern Ohio Traction & Light dropped to 29¼, in spite of the report of the biggest month in the history of the company. Western Ohio receipts sold at 13. Although this road is making good gains and the security is made much better by the decision to acquire the Findlay-Lima road, the stock seems to continue to decline. Apparently this is due to the fear that the Schoepf syndicate will acquire the Dayton & Troy, the southern connection, and cut the Western Ohio out of Dayton. Columbus Railway & Light has been in strong demand at Columbus, and it has been advancing gradually until this week it sold at 86¾, a high mark for the stock; about 900 shares changed hands on the upward movement. There are more rumors that the property is to be taken over by the Schoepf syndicate.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks and the active bonds as compared with last week:

	July 18	July 24
American Railways	52⅛	52
Boston Elevated	152	151
Brooklyn Rapid Transit	73½	74⅛
Chicago City	160	160
Chicago Union Traction (common)	3⅝	4
Chicago Union Traction (preferred)	12	12
Cleveland Electric	—	73½
Consolidated Traction of New Jersey	78	78
Detroit United	90	90½
Interborough-Metropolitan, W. I.	35¾	36⅝
Interborough-Metropolitan (preferred), W. I.	73⅛	74⅞
International Traction (common)	a54	54½
International Traction (preferred), 4s	79	78½
Manhattan Railway	148	147
Massachusetts Electric Cos. (common)	18½	18½
Massachusetts Elec. Cos. (preferred)	68	68¼
Metropolitan Elevated, Chicago (common)	26	27
Metropolitan Elevated, Chicago (preferred)	66	67
Metropolitan Street	—	—
North American	93	93
North Jersey Street Railway	27	27
Philadelphia Company (common)	47¾	49
Philadelphia Rapid Transit	29	30
Philadelphia Traction	98¾	99
Public Service Corporation certificates	67¼	67½
Public Service Corporation 5 per cent notes	95½	95½
South Side Elevated (Chicago)	95	95
Third Avenue	124	124
Twin City, Minneapolis (common)	113	112¾
Union Traction (Philadelphia)	63	63¼
West End (common)	—	—
West End (preferred)	—	—

a Asked.

Metals

The iron and steel markets continued active and strong. Advices from the West report a growing scarcity of pig iron for immediate delivery, and from the South comes the announcement that Southern foundry irons have advanced to $14 at Birmingham, thus putting the price back to where it was before the cut of last month. Sales of finished steel are reported well up to the rate of distribution in the previous months. Railroads are laying in large quantities of track supplies, and the large equipment companies report a very heavy volume of business, which is taken as an indication of a continuance of the present conditions for some time to come. The copper metal market has ruled somewhat easier, but quotations have not changed materially. Lake, spot, is quoted at 18⅜ and 18⅝c., electrolytic at 18 and 18¼c., and castings at 17¾ and 18c.

BALTIMORE TRACTION REFINANCING

The United Railway & Electric Company, controlling and operating all the lines in Baltimore and suburbs, has announced its plan for refinancing the system and making extensive improvements. It provides for funding back interest on the income bonds and using the charter of the Maryland Electric Company as a basis for future improvements, with an $8,000,000 bond issue. It is proposed to consolidate the Maryland Electric Company with the Baltimore & Annapolis Short Line, the latter to be operated by electricity. Alexander Brown & Sons have been named the fiscal agents. The plan has been approved by the income bondholders' committee. The income bondholders will receive 5 per cent thirty-year coupon bonds, dated June 1, 1906, at par for the income coupons from June 1, 1904, to June 1, 1906.

INDIANAPOLIS TRACTION & TERMINAL COMPANY'S EARNINGS

Hugh J. McGowan, president of the Indianapolis Traction & Terminal Company, appeared before the Indiana tax board a few days ago and stated that during the last fiscal year the company earned a total of $2,207,578.72, and that the net earnings were $216,330.01. The gross earnings a mile of track were $17,024.59 and the net earnings per mile $1,663.31. The total operating expenses of the road for the year, Mr. McGowan said, were $1,060,490.62, constituting the following items: Maintenance of way and structures, $57,147.66; maintenance of equipment, $117,297.36; conducting transportation, $533,309.55; general miscellaneous expenses, $352,736.05.

In its report filed with the tax board the company puts a total valuation on all its property of $922,349.49. This includes the traction terminal station building at $568,710; other buildings, $8,720; 12 miles of track, $84,854; 134 motors, $79,800; cars, etc. The value of the equipment is given at $178,085.

REPORT OF THE UNITED RAILWAYS OF ST. LOUIS

The United Railways Company, of St. Louis, reports an increase of $13,389 in the net income for June, 1906, over the net income for June, 1905, and an increase of $323,061 in the net income for the first six months of 1906 over the net income during the corresponding period of last year. This showing is made against an increase in the expenses. The gross earnings and other income for the first six months of 1906 were $4,400,267, as compared with $4,046,088 during the corresponding period of 1905, an increase of $348,179. The expenses, taxes and depreciation for the first six months of 1906 were $2,724,282, as compared with $2,699,179 for the first six months of 1905, an increase of $25,103. The net earnings on June 30, 1906, were $1,675,985, as compared to $1,346,909 on June 30, 1905, an increase of $329,076. The charges, to be deducted from the net earnings, were $1,189,322 for the first six months of 1906, as compared to $1,195,337 for the corresponding period in 1905, a decrease of $6,015. The net income on June 30, 1906, was $486,663, as compared to $151,572 on June 30, 1905, an increase of $323,061.

The comparative statement for June is: Gross earnings and other income, $791,402 in 1906, as compared to $746,101 in 1905, an increase of $45,301; expenses, taxes and depreciation, $483,854 in 1906, as compared to $451,128 in 1905, an increase of $32,726; net earnings, $307,548 in 1906, as compared to $294,973 in 1905, an increase of $12,575; charges, $198,026 in 1906, as compared to $198,840 in 1905, a decrease of $814, and net income, $109,522 in 1905, as compared to $96,133 in 1905, an increase of $13,389.

AN IMPORTANT ROAD CONTEMPLATED FOR INDIANA

J. G. White & Company, of New York, have completed estimates and surveys for an important addition to the traction system centering in Chicago, which will be an electric railway 70 miles long from South Bend, Ind., to the Illinois-Indiana State line in the city of Hammond, to be known as the Chicago, Lake Shore & South Bend Railway. It is reported that the road will be financed by the Transit Finance Company, of New York, and it is expected that the line will be completed by the Illinois Central from Hammond northwest into Kensington, there making connection with the Central tracks for a continuous route into Chicago. The Illinois Central is bound by traffic agreements not to build east of the State line, which accounts for the rather unusual construction conditions.

From Hammond the new road will run eastward into the new United States Steel Corporation city of Gary, crossing the Grand Calumet River just before entering the city. From Gary east to Dunne Park the electric line will practically parallel the tracks of the Lake Shore & Michigan Southern, crossing them as well as the tracks of the Baltimore & Ohio Railroad from the south to north at Miller. From Dunne Park to Michigan City the route of the electric road will lie between the tracks of the Michigan Central and the shore of Lake Michigan. The route from Michigan City is almost straight east to South Bend, a distance of about 30 miles. The tracks of the Lake Erie & Western Railroad and of the Pere Marquette will be crossed about a mile east of Michigan City. From New Carlisle into South Bend the electric road will be exactly parallel to the Lake Shore & Michigan Southern for a distance of 14 miles. It is anticipated that a steamer service from Michigan City to Chicago will be run in connection with the new road, giving the residents in the district from Michigan City to South Bend, inclusive, a particularly quick and convenient route into Chicago. The road will be for both passenger and freight traffic, and that it will be thrown into direct competition with the steam roads in the district is at once apparent. Indeed, the situation now obtaining on the south shore of Lake Erie between Cleveland and Toledo will be practically duplicated on the completion of the new road. It is not as yet determined whether the line will be single or double track.

The construction will conform to the best interurban standard and track will be laid with 75-lb. rails. The specifications in the case of the single-track line call for a width of 18 ft. on the fills and 21 ft. in cuts, with side slopes 1½ to 1. All bridge structures, except the one over the Calumet River, will be of concrete or steel, and two trolley wires will be included in the overhead equipment. In case the single-track road is decided upon, eight sidings, each 2700 ft. long, will be provided. Specifications for double-track road provide for a width of 31 ft. on the fills and 34 ft. in cuts. The conditions of grade and curvature will be very moderate over the entire line. On 85 per cent of the road the grade will not exceed 2-10 of 1 per cent, and the usual maximum for overhead crossings will be 2 per cent. At two points, however, the grade on these bridges may run to 5 per cent. As approved, the total curvature for the line amounts to 1034 degs., divided between fifty-nine curves, practically all within the city limits of the various towns en route.

STREET RAILWAY SITUATION IN SAN FRANCISCO

Service has been resumed on the Guerrero Street line of the United Railroads in San Francisco, thus adding another road for the Mission district of the company's system. As soon as the work on the Valencia Street line, which is now in progress, has been completed, the whole of the Mission will be opened up for transportation.

On the Haight Street line there are 100 men at work, and the repairs on the tracks of that line are progressing rapidly. The McAllister Street line has 125 men at work on the new rails, and it will be pushed to completion at the earliest opportunity. Work on the westbound track of the Sutter Street line is proceeding steadily, and the men are now engaged between Van Ness Avenue and Fillmore Street. The entire bed of the road is being torn up in order to get up the old rails of the cable cars and the slot. Large masses of the rock and concrete roadbed are being taken out. A rock crusher is being operated on the line to assist in making a new roadbed. The rock crusher is placed on a flat car, and the masses of concrete are lifted on the car, run through the crusher and come out through the bottom of the car finely broken for use in forming the new roadbed. This greatly accelerates the work and does away with the necessity of hauling in materials other than cement for the new construction.

Work has been started on the tracks of the Sacramento and Jackson Streets cable lines, and it is hoped to have them running in a few weeks.

The Sansome Street line, which has been waiting for the removal of a pile of debris at Bush Street, has resumed operations, and the cars are now running regularly on a 12-minute headway.

Plans are being perfected for a large loop at the foot of Market Street in front of the Ferry Building. The congestion of the traffic at that point has long made the scheme of the loop appear advisable, and the officials of the road determined that at the earliest possible opportunity it should become a reality. The designs are being made for the work and it is expected that work will begin within a few weeks and that two months will see the project completed. At present the cars are forced to switch, which seriously delays traffic, especially during rush hours.

The lack of available rolling stock will probably retard the resumption of service on some of the new street car lines that are being repaired and gotten in order for service. Every car that the United Railroads possesses is now in commission, and there is still a crying need for more. One large shipment of fifty cars is being delivered, but they are not ready for service, and will not be available for some time. In addition to these, there are eleven new suburban cars of the finest type to be finished in mahogany, which will be used on the suburban lines. Another order for 100 cars has also been placed. But none of these is ready, and it is feared that the scarcity of cars will interfere with the resumption of service on some of the lines now being opened.

It is now expected that early in August cable cars will be in operation on the California Street system. The wrecked power house is being put in shape, new cable cars have been ordered and the main line of the system from the ferry to Presidio Avenue will soon be ready for operation. The opening of this route will give ready access to Pacific Heights and that part of the Western Addition which has not been reached by a car line. It will also give a direct connection with part of the new business district and the ferries.

YOUNGSTOWN LINES PLACE CONTRACTS

The contract for the electrification of the Youngstown & Southern Railway, which at present is operated as a steam road, has been placed with J. G. White & Company, of New York. The road was built from Youngstown to Columbiana several years ago by J. G. White & Company, and was originally designed as a third-rail electric line, but this plan was abandoned and other parties took over the road and operated it as a steam road. Recently the company made amicable arrangements with the Youngstown & Ohio River Railway, which threatened to build a parallel line, and under this arrangement the Youngstown & Southern will extend its line to Leetonia, while the Youngstown & Ohio River will build from Leetonia to Salem, Lisbon and East Liverpool. The two companies have a traffic arrangement for operating cars through from Youngstown to East Liverpool.

The Youngstown & Ohio River Company, which was financed by Will Christy, George Stanley and others of Cleveland, placed contracts last week with the Westinghouse Electric & Manufacturing Company for the entire electrical equipment of the line. The contract includes two 1000-kw 390-volt Westinghouse-Parsons turbo-generators; nine 300-kw rotary converters for four sub-stations, and Westinghouse No. 112 (75 hp) four-motor equipments for ten cars, together with air brakes for the cars. The main power station for the road will be located at West Point, between Lisbon and East Liverpool, and will be but a short distance from large coal mines, from which the house will receive its fuel supply. This house will supply the Youngstown & Southern as well as the Youngstown & Ohio River line, and one sub-station will be installed for the first mentioned line at a point near North Lima. The Cleveland Construction Company, which has the contract for building the Youngstown & Ohio River, has placed a contract with the P. J. Guthrie Construction Company, of Columbus, for 6 miles of construction work which will be done with steam shovels, as it involves a large amount of heavy work. Grading is being pushed at several points. A portion of the line will be placed in operation late this fall.

BONDHOLDERS OF TOLEDO & WESTERN APPOINT PROTECTIVE COMMITTEE

The bondholders of the Toledo & Western Railway Company have appointed a committee composed of J. K. Secor, J. G. Mitchell and H. C. Rorick to protect the interests of the bondholders of the property. All the bondholders have been asked to deposit their bonds with the Ohio Savings Bank & Trust Company, of Toledo. It is thought that if the bond interest is not arranged for in the near future the bondholders will ask to have the bonds foreclosed. A stockholders' committee composed of W. L. Hayes, C. N. Stone and G. E. Collins has sent a communication to the stockholders urging them to deposit their stock with the Citizens Savings & Trust Company, of Cleveland, in order that the proposition of J. R. Nutt and associates of Cleveland to pay 6¼ for the entire outstanding capital stock may be carried through. The communication sets forth that the interest on the bonds together with the floating debt now due amounts to a sum equal to $25 a share, for which the stockholders would be liable should it become necessary to levy an assessment. The committee undertakes to protect the interests of the stockholders to the end that every holder shall share equitably in the proceeds of any reorganization, refinancing or sale of the property.

ELECTRIC CARS OPERATING ON STATE STREET, CHICAGO—PLANS FOR ELEVATED RAILWAY MERGER

Electric cars are now being operated on what was formerly the State Street cable line in Chicago. The last cable train to make the trip was operated over the line early Sunday morning, July 22. Permission to substitute electric traction for cable operation was granted to the company less than one month ago. New cars for the trolleyized lines have not yet arrived, and cars of the type running on Halsted Street are being operated on State Street. The change in the motive power has enabled the running time from the downtown district to Sixty-Third Street to be cut down 10 minutes and the trip is now made in 40 minutes.

The Blair-Mitchell interests which control the Northwestern and the Oak Park elevated lines, Chicago, are reported to have made offers to the Metropolitan and the South Side Elevated companies for the control of these lines. If the plans for the consolidation of the four elevated railway systems in the city is consummated, the routeing of the trains will most probably be changed to allow trains to travel from one section of the city to the other. This would avoid the trains making a complete circuit of the loop in the business district and would reduce the congestion on this portion of the system, over which at the present time about eighteen hundred trains are operated every twenty-four hours.

Mayor Dunne has prepared a tabulated list showing the proportion of deaths per 100,000 population, due to street railway accidents in the larger cities in the United States. The report shows that there are four other cities in the United States having more fatalities than Chicago per unit of population. The cities as tabulated are: Pittsburg, 11 7-10; Cleveland, 8 8-10; Detroit, 7 3-10; St. Louis, 7; Chicago, 6 1-10; New York, 4 8-10; St. Paul, 1 8-10; Indianapolis, 1 6-10; Buffalo, 1 6-10; Washington, 1 4-10.

Contracts for lowering the three tunnels under the Chicago River were let by the receivers of the Chicago Union Traction Company July 23. The successful bidders were John P. Agnew, for the tunnel under LaSalle Street; Angus Brothers & Company for the Washington Street tunnel, and the Great Lakes Dredge & Dock Company for that at Van Buren Street.

The contracts stipulate that the portions of the tunnels obstructing navigation must be removed before the opening of navigation in 1907.

W. S. Barstow, of W. S. Barstow & Company, Inc., engineers, has just returned from Portland, Ore., after a four weeks' trip. He reports that there is in contemplation the building of several miles of railroad extensions in connection with the Oregon Electric Railway Company, for whom W. S. Barstow & Company are now building and equipping about 60 miles of road. It is expected that part of the main line between Portland and Salem will be in operation Sept. 1, and that cars will be operated between the two cities by July 1, 1907.

NEW HAVEN TO ELECTRIFY MORE LINES

Another announcement of importance by the New York, New Haven & Hartford Railroad Company regarding the electrification of branch lines has been made. It is to the effect that it is proposed to equip with the overhead trolley the lines of the company from Middletown to Berlin and Meriden.

ACCIDENT FAKIRS APPREHENDED

B. B. Davis, secretary of the American Street and Interurban Railway Claim Agents' Association, has just issued a circular calling attention to a coterie of accident fakirs who have acted in different cities under various aliases. The first alleged accident reported was on the Dayton City Railway in April, 1906, and they gave the names of John Hall, Rodney Hall and Earnest Carruth. On May 6, 1906, they had an alleged accident on the lines of the Indianapolis Traction & Terminal Company, Indianapolis, Ind. Through the efforts of George Harvey, assistant claim agent, two of them, Walter Carruth, alias John Heyden, alias John Hall, and Earnest Carruth were arrested. On June 20, 1906, they were tried and convicted of a felony and given an indefinite sentence in the penitentiary. They are also said to have brought alleged accident claims against the Lexington Railway Company, Lexington, Ky.; South Covington & Cincinnati Railway Company, and the Cincinnati Traction Company. Rodney Hall, who acted as witness, has not yet been apprehended.

NOTES FROM MEXICO

The MacKenzie interests of Toronto, which own the street railway systems at Monterey, are preparing to extend the lines to El Porvenir and other suburban points up the Santa Catarina Valley. Engineer George S. Binckley has been making an investigation of the water afforded by the Pilon River, with the view of establishing the power plant of the railway system at some point on that stream.

A syndicate of Mexican capitalists with a capital stock of $500,000 has taken steps to construct an extensive street railway system in the flourishing town of Iguala. A concession has been obtained from the government of the State of Guerrero.

New York capitalists are said to have become interested in the project of building an electric railway between Saltillo and Arteaga, a distance of about 10 miles. W. H. Lilliendahl, of Saltillo, who is promoting the enterprise, has been in the United States for some time on business connected with the proposed road. Arteaga is a manufacturing town of importance, and the proposed line is to do a freight as well as a passenger business.

Ramon Fabela is making surveys for the proposed electric street railway system that is to be built at Parral by General Jose M. de la Vega and Colonel Antonio Ramos Cadena.

A number of wealthy land owners of the State of Tlaxcala have organized a company called the Ferrocarril Agricola, for the purpose of building a tramway through the richest agricultural part of the State. It is proposed that animal traction be used pending the installation of electricity.

The properties of the Puebla Tramways Company, which were recently purchased by a Canadian syndicate, comprise about 20 miles of track. C. H. Cahan, the representative of the Canadian syndicate, with headquarters in Mexico City, who conducted the negotiations, says that the 20 miles of existing track will be electrified and about 25 miles more track added to the system. The same syndicate has also purchased the properties of La Compania Anonima del Alumbrado Electrico de Puebla. The plans for improvements and extensions of these two systems call for a large expenditure. These two companies were among the interests of the firm of Werhner, Beit & Company, of London. The lines are operated by mules. The city of Puebla will soon pave a number of its streets with asphalt, and the track on several of the lines will have to be relaid. While this work is being done the lines will be practically rebuilt. The largest cotton mills in Mexico are situated near Puebla, and the new owners intend to extend the suburban lines to these plants and to handle freight as well as passengers. The Mexican Light & Power Company, which has its generating plant at Necaxa and is now furnishing electric power and lights for Mexico City, El Oro and other places, is closely affiliated with the new owners of the Puebla systems and the light and power plant of the town.

BALTIMORE MEN RECEIVE VOLUNTARY INCREASE

Beginning with July 11, the United Railways & Electric Company, of Baltimore, voluntarily granted a liberal increase in the wages of its car men. Although this means an additional annual expenditure of about $300,000, the directors did not hesitate to carry out the recommendations of Wm. A. House, second vice-president and general manager, who told them that the conspicuous loyalty of the men was worthy of substantial reward. Coming so soon after its heavy losses in the great Baltimore fire, the action of this company is especially praiseworthy, besides indicating the determination to retain and secure the best class of men. The cordial spirit existing here between employer and employee is well shown in the following notice. Up to this time the rate of pay has been 15½ cents to Class 1, 16 cents to Class 2, and 16⅔ cents to Class 3:

THE UNITED RAILWAYS & ELECTRIC COMPANY
Office of the General Manager
General Order No. 205 to Motormen and Conductors

Since the last voluntary increase in the rate of pay of motormen and conductors on April 1, 1903, this company suffered great loss by the disastrous fire of February, 1904. It has gradually recovered from the effects of that catastrophe, but since then has had to make heavy expenditures in the reconstruction of tracks, upon its Pratt Street power house, and by the purchase of cars, all of which have been met from the daily receipts. While the company must continue to spend large sums in the further rebuilding of its system, the management feels that it is but due the motormen and conductors to recognize in a substantial way the loyalty and efficiency shown by them in the performance of their respective duties, and the board of directors, therefore, has this day authorized the following increases, effective July 11, the beginning of the second pay-roll period of the month:

Class No. 1 will comprise men who have been in the service less than two years, and will be paid 18 cents per hour.

Class No. 2 will comprise men who have been continuously in the service over two years and less than five years, and will be paid 19 cents per hour.

Class No. 3 will comprise men who have ben continuously in the service more than five years, and will be paid 20 cents per hour.

It is believed that every individual in the service will fully appreciate his dual responsibility to the traveling public and the company, and realize that while on duty he is not only a representative of the latter, but that his actions will reflect either creditably or otherwise upon his company.

July 12, 1906. WM. A. HOUSE,
Second Vice-President and General Manager.

MR. CALDERWOOD DISCUSSES ACCIDENTS ON THE BROOKLYN RAPID TRANSIT COMPANY'S LINES

Vice-President Calderwood recently sent to the New York State Railroad Commission a report in which was given the number of fatal accidents that occurred on the Brooklyn Rapid Transit lines in the year ending June 30, 1906.

"During the year," Mr. Calderwood said, "there were 111 accidents resulting in fatal injury or death of persons. Of this number but thirteen were passengers. The members of the State board are in close touch with the local conditions and are fully cognizant of the various conditions which render the operation of trains and cars in the district we serve particularly hazardous. Some of these, such as what have become known as the 'rushes' at the bridges and the congestion of traffic on downtown streets, are peculiar to Brooklyn and are directly attributable to the topography of our city, and the very great volume of traffic forced on our lines during comparatively short periods of time.

"The proportion of accidents is naturally greater during the summer months—the time of heavy travel to Coney Island and the various other beaches—than during the rest of the year. During the year in question this company has handled 452,604,203 passengers, carrying them 63,657,323 miles. This represents, in round numbers, five times the entire population of the United States. For every four million passengers carried the life of one has been lost, or we have carried the entire population of Brooklyn three times with the loss of one life.

"We do not—it is needless to say—attempt to justify any fatalities, and are using every means in our power to avoid them. Our success in safeguarding our passengers is, in a measure, indicated by the fact that of the total of 111 fatalities, no liability on the part of the company existed in 76 cases. For the purpose of comparison, we submit corresponding figures for the fiscal year ending June 30, 1905, showing practically the same ratio of one fatal accident to each four million passengers carried. For the year ending June 30, 1905, there was a total of 96 fatalities and we carried 389,505,840 passengers, transporting them 57,742 miles."

BOSTON ELEVATED RAILWAY PLANS NEW STATIONS FOR EIGHT-CAR TRAINS

The Boston Elevated Railway has filed with the Board of Railroad Commissioners a new set of plans of the new station at Forest Hills, which are a modification of the plans approved by the board June 21, 1905. Under the new plans there will be two separate stations at Forest Hills Square, the one on the west side of Washington Street being for cars outward bound from Boston, and the one on the east side being for inward cars. The proposed stations will accommodate eight-car trains, making the Forest Hills station the largest in the elevated system, as it will be about twice the size of the Dudley Street terminal.

The unloading platform for the southbound elevated trains will commence at Morton Street, and at its southerly end will be the loading platform for surface cars bound south, which will extend to Tower Street. The elevated loop will also extend as far as Tower Street, and to return to the northbound station on the easterly side of Washington Street it will pass over private property. All the property bounded by Morton, Washington and Tower Streets and Stony Brook will have to be taken, as well as the property south of Stony Brook, between the brook and Tower Street. The surface cars will enter the station at surface grade, and provision is made that surface cars bound in either direction may take a loop in the station and return, or continue on through the station in the same direction. The northbound surface cars will leave Washington Street at Tower Street, at which the unloading platform for northbound cars begins, and an escalator or inclined stairway will take them to the elevated platform, which will extend to Morton Street.

The company is desirous of putting on its eight-car trains as soon as possible, and all the stations in the new Washington Street subway have been constructed with this end in view. The old subway, in which the stations will not accommodate trains of more than five cars, long ago proved inadequate to handle the business of the company, and there is a possibility that it will be abandoned as soon as the new tunnel is completed. The company has also asked for authority to construct a siding on Washington Street, between Hawthorne Avenue and Dudley Street, as an extension of the existing siding between Hawthorne Avenue and Guild Street.

ERIE GASOLINE CARS FOR SERVICE ON STEAM RAILROAD LINES IN OHIO

General Passenger Agent Wallace, of the Erie Railroad (steam), has announced that his company will utilize the first gasoline cars now being experimented with in the East, on the stretch between Cleveland, Leavittsburg and Youngstown. The business between these points is very heavy, and the Erie has found it necessary to increase its train service several times of late. This route was doubtless selected to forestall, if possible, the plans of the Eastern Ohio and the Mahoning Valley Traction Companies, which are planning to co-operate on a through high-speed service between Cleveland and Youngstown.

NORTHERN OHIO TRACTION & LIGHT COMPANY'S STOCK TO BE INCREASED

Stockholders of the Northern Ohio Traction & Light Company will meet Aug. 15, for the purpose of voting on the proposition to increase the capital stock of the company for the purpose of taking over the Canton-Akron system and for needed improvements. The Canton-Akron Railway Company, the Canton & New Philadelphia Traction Company and the Tuscarawas Traction Company have already been formally consolidated, and the merger of this company with the Northern Ohio will be effected about Sept. 1. When the deal is consummated, the outstanding bonded indebtedness of the Northern Ohio Traction & Light Company will be $10,500,000 and the capital stock outstanding will be $7,938,000. The present preferred stockholders of the Canton-Akron Company will receive divisional lien 5 per cent bonds, while the common stockholders of the three companies will receive an equal amount of the common stock of the Northern Ohio Company, which is now on a 2 per cent dividend basis. The new company will have gross earnings of about $1,600,000.

CLEVELAND COMPANY OFFERS SEVEN TICKETS FOR A QUARTER—MIDNIGHT RAID BY MAYOR JOHNSON'S FORCES

The Cleveland Electric Railway Company has submitted to the City Council its formal proposition for a renewal of existing franchises for twenty-five years. The proposition calls for the sale of seven tickets for 25 cents; present transfer privileges to be continued, with their extension to all subsequently constructed lines of the system; the construction of such high-speed lines, elevated or subways, as may be desired; the building of a crosstown line on Gordon Avenue, giving the people of the west side the same crosstown advantages that those of the east side now enjoy; and the submission of the entire proposition to the vote of the people at the next general election if the Council is in doubt as to the public will.

The proposition was in the form of a letter from President Horace Andrews, and this will be followed at the next Council meeting by an ordinance. In part, Mr. Andrews' letter was as follows: "The ordinance will gain for the people of Cleveland an immediate reduction in fare to the lowest point at which it has been demonstrated in this country a comprehensive street railway system can be successfully operated, allowing for the rates of wages paid in this country—a reduction in fare which amounts to over a million dollars a year to the riding public, or during the life of existing franchises from $8,000,000 to $12,000,000. The rate of fare proposed is equal to 3.57 cents per ride. It is estimated that over 90 per cent of the passengers will buy tickets; that 5 per cent will be transients or out-of-town people, and that the remaining 5 per cent will pay 5 cents cash. The proposed fare is therefore a 3½-cent fare, entitling passengers to present transfer privileges to all new lines constructed. The company stands ready to build the Gordon Avenue line and operate it as part of its general system, and submits that the passengers on this line and in this district will be better served under the rates of fare proposed with transfers than is possible by any other company. The company presents a map of the system showing the lengths of ride possible for one fare and transfer, from which it will readily be seen that the public would be much better served at the 3½-cent fare, and that immediately, than may be had for a 3-cent fare with limited rides and limited transfers in limited sections of the city. It is asked that the Council find some fair method to submit the entire question to the public for its approval or disapproval at the next general election."

Immediately upon reading the proposition Mayor Johnson announced that he would veto the ordinance if it was passed. He said he would veto an eight-ticket-for-a-quarter ordinance if it was presented. He intimated that the stock of the Cleveland Electric would immediately jump to 150, or more than double the figure at which it is now selling, if the ordinance was passed. President Andrews replied by offering to contract in advance for the sale of all the stock at a much lower figure.

Among Cleveland financial people the opinion is expressed that the company cannot afford to make such a proposition; that the stock would fall rather than advance if the ordinance passes. None of the estimates made by financial authorities shows up as favorably in the way of profits to the company as the estimates made by Mr. Andrews. One authority says that the loss in gross earnings the first year would be $1,125,000, instead of $1,000,000 as estimated by the company. In the factories, on the street and in the cars, the general comment is that the proposition is a most liberal one and that it ought to be accepted. If the people are given an opportunity to vote there is no question that the company would receive a favorable reply.

The officials of the Forest City Railway Company have signified their willingness to have the proposition placed before the public, and have announced that they will also submit a proposition. It will involve 3-cent fare on the lines it has under construction, but of course it could not offer transfers covering all parts of the city, which is the feature most desired by the majority of people.

As an alternative, the officials of the Cleveland Electric still have an opportunity of accepting the proposition made by Henry Everett and associates to lease the property on a guaranteed dividend basis. The proposition is still open, and it is understood that it involves the taking over the system on a ninety-nine-year lease with a graduated rental starting at 5 per cent on the present stock, the syndicate to put up $3,000,000 as a guarantee that the rental would be paid. Some of the directors are said to be in favor of accepting the proposition. Of course, if it was accepted the property would be turned over on the present basis, and Mr. Everett would then take up the work of securing a new franchise.

A well-informed traction man believes that the chief obstacle in the way of any plan to turn over the property to the Everett people would be Mr. Andrews' personal antipathy against withdrawing from a fight under fire after having been engaged in it for several years, and especially against turning over the fight to Henry Everett, who for many years has been Mr. Andrews' rival in the control of the property.

As this paper was on the press a telegram was received from Cleveland that Mayor Johnson, with 500 men, on the night of July 24, pulled up the Cleveland Electric Railway Company's track on Fulton Street to make way for the low-fare line to reach Public Square. A temporary injunction was secured the next morning, but the Mayor paid no attention to it, and he must now answer for contempt of court. This coup is being generally denounced as a high-handed proceeding, as the old company's franchise on this street does not expire until 1908.

LARGE GAS ENGINE PLANTS

The Carnegie Steel Company has purchased for its Homestead works two 2000-kw alternating-current generators driven by gas engines. These units are to be furnished by Allis-Chalmers Company, of Milwaukee, and they complete an order recently given for machinery costing approximately one million dollars to be built by Allis-Chalmers Company for the Homestead plant. It includes three gas engine-driven electric units and four gas blowing engines, the aggregate capacity of these machines being nearly 30,000 hp. This follows close upon the recent million-dollar order given to Allis-Chalmers Company by the Indiana Steel Company for the electrical equipment of its new plant at Gary, Ind., where gas engines of the same type and capacities, operating on waste gas from the blast furnaces, are to serve as prime movers for electric generators supplying current to the steel mills. Other purchases of gas blowing engines and gas engine-driven electrical units made from Allis-Chalmers Company amount to practically a million dollars more, so that sales during the past few months have aggregated $3,000,000.

Now another notable sale of gas engine-driven electric generating units has just been made to the Milwaukee Northern (electric) Railway Company, whose plant will represent the largest installation of this kind on the continent. The power house of this company, which will be situated at Port Washington, Wis., is to contain three horizontal twin-tandem gas engines, each having a rated capacity of 1500 hp, with liberal allowance for overload, direct-connected to three 1000-kw, 3-phase, 25-cycle alternating-current generators. The complete units will be built and installed by Allis-Chalmers Company. The exciting units for these generators, which are to be driven by special vertical gas engines, will also be furnished by Allis-Chalmers Company. All of the engines are to operate on producer gas.

TESTS ON THE NEW YORK CENTRAL LOCOMOTIVES

Last October the first half of the 50,000 mile endurance run of the first high-speed electric locomotive No. 6000, built jointly by the General Electric Company and American Locomotive Company, was completed on the test tracks of the New York Central lines in Schenectady. On June 12, this locomotive completed the second half of this exhaustive service test. The maintenance expense per mile for the complete 50,000-mile run amounted to $0.0126. This figure includes all maintenance expense on motors, brake-shoes, tires, inspection, and other miscellaneous items. Moreover, the operating conditions were much more severe than those to which the thirty-five electric locomotives, which have been ordered, will be subjected. The test locomotive hauled a train averaging from 200 to 400 tons over a 6-mile track, and high-speed running under these conditions involved higher braking and accelerating duty than in regular operating service. There are in all fourteen machines now complete. Of these, two have been shipped to New York. The remaining locomotives are well under way at the shops of the General Electric Company and American Locomotive Works, and it is expected that the complete number, thirty-five, will be ready for service early in October.

CHICAGO TRACTION OFFER

On July 21 the traction companies gave the Chicago Council committee on local transportation the figures at which they would agree to sell to the city their present tangible properties. The figures are: Chicago City Railway Company, $20,103,935; Union Traction Company, $27,401,218; total, $47,505,153. Mayor Dunne at once declared the figures to be "grossly excessive," and the committee referred them to two experts for analysis and report. The figures are based on the cost of "reproduction, at current prices, less cost of bringing property at this date up to a condition operatively equal to new," to quote from the City Railway statement. That of the Union Traction Company puts it in this way: "This amount has been arrived at by determining the cost, at current prices, of reproducing the property in question, and deducting therefrom the amount of money that would be required to place the present property in a condition as good as new."

Both statements contain the declaration that the cost of changing the present cable lines to trolleys and lowering the tunnels would have to be added if the city wanted to purchase after the transformation.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JULY 17, 1906

825,927. Electrical Signal System; Carl P. Nachod, of Wilkinsburg, Pa. App. filed Aug. 2, 1905. A block signal system for use with single-track trolley roads which have turnouts at predetermined intervals. A shaft is stepped around by an electromagnet whenever a car enters a block, and is reversely rotated by another magnet whenever the car leaves the block. The signal circuits are closed by the movements of this shaft.

825,975. Railway Rails; J. Moyle, of Saxton, Pa. App. filed Feb. 7, 1906. A railway rail having a longitudinal channel in its web and a tread having a fin engaging the channel and the flange fitting against the side of the web, bolts being passed through the flange and web and fin.

825,988. Railway Signaling System; Lewis H. Thullen, of Edgewood Park, Pa. App. filed June 20, 1905. A signal system of that class in which the rails are divided into block sections and energized to a potential difference by a battery. The rails are also connected to a transformer primary circuit, the secondary of which includes a relay magnet.

826,003. System of Signaling; Paul Winsor, of Weston, Mass. App. filed Jan. 27, 1902. This patent covers the application of an alternating current to the track rails and the plan of locating the signal relays in a transformer circuit with the rails.

826,050. Trolley Pole; Augustus Neubert, of Elizabeth, N. J. App. filed Nov. 5, 1903. The trolley harp is extended upward on either side of the wheel and has a pair of outwardly flaring prongs on each side, the purpose of which is to prevent displacement of the wheel when passing crosstown arches.

826,084. Street Railway Switch; Horace Blanchard, of Boston, Mass. App. filed Aug. 4, 1905. A removable detent for locking the switch point fitted in the bed plate and extending between the side walls and under the tongue, the central portion of the detent being thicker than the side portion.

826,136. Bond; Francis B. Badt and George M. Willis. App. filed March 10, 1902. The bond has a pair of tubular plugs in its ends which may be extended into the rails so as to make good electric contact therewith, in the manner of an ordinary boiler tube.

826,138. Collector; Benjamin Harry Bedell, of London, England. App. filed Nov. 22, 1904. Relates to railways of that class having contact plates inset in the roadbed at spaced intervals. The car has a depending chain to make contact therewith, and means are provided by which the chain is depressed only at the region of the contact plate.

826,199. Switch Operating Mechanism; Arthur E. Stevenson, of Buffalo, N. Y. App. filed Oct. 12, 1905. A pair of special trolleys are laid between the usual track rails and collector shoes are pivoted to depend from the wheel axles, and are spring-pressed into engagement with the trolleys.

826,256. Railway Block Signal System; Charles M. Kirwan, of Baldwinsville, N. Y. App. filed April 18, 1905. A series of tappets may be set by magnets in a position to be depressed by passing trains. If trains are too close together, circuits are closed which move a train-stop arm into position to give an alarm circuit on the rearmost train.

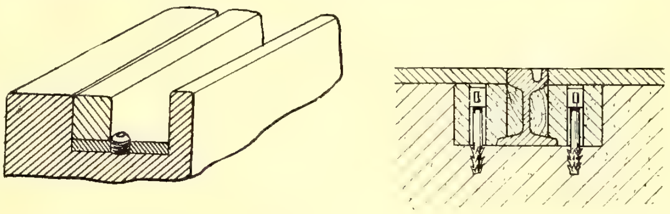
826,296. Trolley; Gurney E. Ward, of Abilene, Tex. App. filed Aug. 11, 1905. The upper end of the trolley pole is flared to produce a recess in which a pair of trolley wheels are contained. One of the trolleys is located in fixed bearings, and the other is spring-pressed upward.

826,307. Electromagnet; Walter W. Brown, of Schenectady, N. Y. App. filed Jan. 9, 1905. A semaphore operating means comprising a movable member, an electromagnet that moves said member, a switch arranged to be operated when said member is moved, and a relay controlled by said switch and adapted to decrease the current through said magnet.

826,315. Electric Railway Motor; Patrick J. Collins, of Scranton, Pa. App. filed Jan. 3, 1905. The field magnets of the motors are made a part of the frame of the truck, and the armatures are directly keyed on the wheel axles.

826,319. Trolley Pole; Pemberton Dudley, of Asbury Park, N. J. App. filed Aug. 11, 1905. The upper end of the trolley pole is flexibly connected with the main portion and capable of lateral motion. It is normally held centrally by springs.

826,344. Embedding for Street Car Rails; Franz Melaun, of Charlottenburg, Germany. App. filed Oct. 13, 1905. Concrete



PATENT NO. 826,344

blocks to be used as filling material over which asphalt is laid after repairing the rails or laying new rails. Obviates the necessity of waiting for the concrete to harden when laid in a plastic state.

826,433. Spring Switch; Clarence C. Korns, of Johnstown, Pa. App. filed Aug. 24, 1905. Switch point may be readily set as a spring switch for either right or left-hand throw. The tongue may be semi-locked in either of its thrown positions.

826,439. Trolley; Bryan McManaman, of Wilkesbarre, Pa. App. filed Sept. 7, 1905. The trolley wheel has prongs fastened to the edges of its two flanges which are stated to close over the conductor in use and prevent the wheel from leaving the wire. The wheel has a feature by which it is removable from the harp.

826,440. Trolley Stand; Bryan McManaman, of Wilkesbarre, Pa. App. filed Oct. 3, 1905. The trolley pole is impelled upward by a counterweight and has springs for limiting the upward movement. In this way the pole is prevented from being thrown upward high enough to be damaged by guy wires.

826,462. Railway Switch Construction; Harry L. Young, f Pueblo, Col. App. filed March 21, 1906. A self-cleaning switch consisting of a supporting base provided with discharge openings and a chair having a set of openings registering with the base openings and another set registering with the tread flange openings.

826,474. Controller Regulator; C. N. Butler, of Philadelphia, Pa. App. filed Dec. 16, 1905. The controller shaft has a plate thereon with depending cam fingers which move into engagement with a detent finger in such a way as to prevent too abrupt movement of a controller shaft.

826,478. Electric Railway Motor; Patrick J. Collins, of Scranton, Pa. App. filed Aug. 11, 1905. The motor field magnets are organized into the frame of the car trucks and the armatures are directly keyed on the wheel shafts.

826,494. Controller Regulator; John P. Durkin, of Philadelphia, Pa. App. filed Nov. 20, 1905. The controller shaft has a ratchet-shaped cam thereon which moves centrically with a stationary cam of the casing. A pivoted finger is engaged with the two cam surfaces so as to prevent an abrupt movement of the controller arm.

826,495. Controller Regulator; John P. Durkin, of Philadelphia, Pa. App. filed Jan. 8, 1906. Relates to a modification of the above in which a ball is used instead of the pivoted finger.

826,508. Electrically Propelled Vehicle; Rudolph M. Hunter, of Philadelphia, Pa. App. filed Nov. 15, 1898. Motor is sleeved upon the wheel axle and has an arm engaged by a pair of opposed springs to keep the motor properly positioned.

PERSONAL MENTION

MR. W. W. WHEATLEY, general manager of the Mexico Electric Tramways, Ltd., has been elected a director of the Mexico City Banking Company, of Mexico City.

MR. H. H. SMITH has been appointed superintendent of the Jackson & Battle Creek Traction Company, in place of Mr. E. S. Loomis, who has resigned. The change took effect July 16.

MR. J. C. YOUNG, general superintendent of the Saginaw Valley Traction Company, of Saginaw, Mich., has tendered his resignation, to take effect Aug. 1. He goes to Chicago to engage in other business.

MR. THOMAS M. KEELEY, assistant general superintendent of the Michigan United Railways Company, who has had charge of the construction work, has resigned and it is understood will take a position with a construction company.

MR. HUGH M. BUEGLER has resigned from the Elmira Water, Light & Railway Company as electrical engineer and is now associated with the Newman properties, in the operating department, as superintendent of railways. Mr. Buegler's permanent address after Sept. 1, will be Nashville, Tenn., where he expects to make his headquarters.

MR. EDWARD JOHN, who has been train despatcher, with headquarters in Lansing, for the Michigan United Railway Company for the past two years, has resigned his position and has left Lansing to accept a position as superintendent of the Norwich & Westerly Railroad, of Norwich, Conn. Mr. John's place will be taken by Mr. L. L. Steadman, who has been in the employ of the company for the past three years.

MR. W. T. DOUGAN, engineer of maintenance of way of the New York City Railway Company, has been appointed by Mr. H. H. Adams, president of the American Street & Interurban Railway Engineering Association, to serve on the executive committee of that association in place of Mr. W. Boardman Reed, who has resigned. Mr. Reed will, however, continue his membership in the association and will continue to serve on the committee of maintenance of way.

MR. W. M. EATON, second vice-president of the Rochester Railway & Light Company, will turn over his duties as general manager of the company to his successor, Mr. R. M. Searle, of Mount Vernon. Mr. Eaton will continue his duties as the secone vice-president of the Railway & Light Company as well as his duties as third vice-president of the Rochester Railway Company. Mr. Searle is at present the general manager of the Westchester Lighting Company, with offices at Mount Vernon, N. Y. He was formerly the general manager of the Atlanta (Ga.) Gas Light Company, which office he held for six years.

MR. A. L. NEEREAMER, heretofore traffic manager of the Columbus, Delaware & Marion Railway, has been promoted to the position of general superintendent, with headquarters in Delaware. Mr. E. J. Davis, heretofore assistant traffic manager, has been made general passenger and freight agent, with headquarters at Columbus; the positions of traffic manager and assistant traffic manager have been abolished. General Manager Geo. Whysall will move his office from Delaware to Marion, where he will give his personal attention to the construction work on the Bucyrus extension of the road.

MR. J. B. McNAMARA, of Cairo, chief electrical engineer of the State Railways of Egypt, has been making a tour of this country, during which he has inspected the Pennsylvania, New York Central, Long Island and other electrified steam roads, and has visited Schenectady, Pittsburg, Milwaukee and other cities. He expected to return by the "Patricia" July 28. Mr. McNamara stated that the management of the State Railways of Egypt has decided to install a 19-km single-phase line near Cairo and put a 10-minute service in operation. The road has previously been operated by steam. Bids will be asked for the construction of this line probably in January.

MR. W. H. HOLLENBECK, who has held the position of superintendent of buildings with the Milwaukee Electric Railway & Light Company for some time past, has resigned. He severed his connection with the company July 1. The name of his successor has not yet been announced. Mr. Hollenbeck came to Milwaukee from the General Electric Company, of Schenectady, N. Y., where he was employed in a similar capacity. As superintendent of buildings with the street railway company, Mr. Hollenbeck had the supervision of all the company's properties, including the new public service building, which was finished just prior to his leaving.

PROF. CHARLES E. LUCKE, of Columbia University, has been appointed by the United States Department of Agriculture an expert to secure data on the use of alcohol as a fuel in small engines. He has issued a general request for any who have any information on the subject to send it to him, especially copies of any patents on motors capable of using alcohol as fuel. Vaporizers, carbureters or complete engines for testing at the Columbia laboratories will be especially welcome. These tests will be conducted without expense except the transportation of the apparatus, and the reports will be published in a bulletin to be published later. Any data or shipments should be addressed to Prof. Chas. E. Lucke at Columbia University, and they will be returned when the test is completed. Acknowledgement also will be given for all assistance rendered in this investigation.

THE OPERATING PERSONNEL of the Public Service Corporation in the Newark district experienced the following changes, beginning July 12: Districts Nos. 2 and 4 were consolidated into one district known as district No. 2, Mr. W. B. Graham appointed district superintendent in charge; Mr. A. M. Stewart, formerly district superintendent in charge of district No. 2, was appointed division superintendent in charge of the Bloomfield, Valley Road, Orange & Passaic Valley and Eagle Rock lines; Mr. Chas. H. Coe appointed division superintendent in charge of the Kearny, Mt. Prospect and Mulberry lines; Mr. A. W. Pratt appointed division superintendent in charge of the Orange, Roseville, Central Avenue and South Orange and Maplewood lines; Mr. Jas. McCabe appointed division superintendent in charge of the Turnpike line, and Mr. J. F. Sparrow appointed division superintendent in charge of the Bergen and Clifton lines.

MR. E. W. T. GRAY, who has for years been manager of the New York sales office of the Westinghouse Electric & Manufacturing Company, resigned recently to take up commercial work in another field. Mr. Gray's decision to sever his connection with the Westinghouse Company was received with great regret by the management, as he was one of the pioneer employees of the company. Mr. Gray began his work with the Westinghouse Company about the year 1890, starting in the laboratory of its original works in the heart of the city of Pittsburg. Later he took up installation work for the company, installing the first railway motors the company made on cars in Lansing, Mich., about the year 1901. Following a short period spent in this work, Mr. Gray was called by the company to its sales organization, with headquarters at Pittsburg. In 1898 Mr. Gray received the appointment of manager of the New York office. Mr. W. C. Webster, who succeeds Mr. Gray as manager of the New York sales office, has a broad general knowledge of the company's commercial policy, and on account of his close association with the sales department in the past enjoys a personal acquaintance with the entire sales force, which should be of great advantage to him in his new work. Mr. Webster entered the employ of the company in 1898, and has always been identified with the sales department.

MR. PIERCE C. KEILHOLTZ has resigned as consulting engineer of the United Railways & Electric Company, of Baltimore. He has held the position since the formation of the corporation, and was previously employed in a similar capacity by the former City & Suburban Railway, which was merged into the present system. Altogether he has been engaged since 1895 in the electrical department of the street railway systems of the city, and for the greater part of that period had full charge of the electrical work in its operation since electricity was introduced in Baltimore as a motive power. It is understood that he has resigned to devote more time to the field of consulting engineer in his special line. Mr. Keilholtz is also the consulting engineer of the Consolidated Gas, Electric Light & Power Company. He will retain this position, which he has also held since its formation, about three years ago. Mr. Keilholtz has had many flattering offers from electric concerns throughout the country, but he has declined them, it is said, because he prefers Baltimore as a home.

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BACK COPIES.—No copies of issues prior to September, 1904, are kept on sale, except in bound volumes.

DATE ON WRAPPER shows the month at the end of which the subscription expires. The sending of remittances for renewal prior to that date will be much appreciated by the publishers.

CLUB RATE.—On five or more subscriptions from one company or its employees, a club rate of $2.50 each per annum is quoted.

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal, 8500 copies are printed. Total circulation for 1906 to date, 253,600 copies, an average of 8181 copies per week.

Ventilating Armature Ovens

There seems to be an idea that the more nearly air tight a baking oven for armatures and fields can be made, the better will be the results obtained. At least, the writer has inspected many ovens which have been built practically air tight. It stands to reason, however, that more moisture can be taken from the contents of the oven if a proper amount of ventilation is provided for. If the box is air tight, after a little while the enclosed air becomes saturated with moisture and can be made to take up more only by heating it to a still higher temperature. If provision is made for letting the heated and moisture-laden air escape and at the same time admitting a fresh supply of dry air, the drying process can be carried on to a greater degree. Of course, when the oven is ventilated a greater amount of heat must necessarily be supplied in order to maintain the same temperature.

Advertising Nuisances

A correspondent in this issue calls attention to an abuse which is by no means new but which seems to be on the increase. We refer to the demands made upon manufacturers to advertise in all sorts of programs, souvenir books, and other publications of railroad relief associations and similar bodies. Contracts of this kind are generally secured by some "business manager" upon a commission basis, and the usual plea advanced is that the recognition requested will be "appreciated" by the officials of the railway company which is connected with the association. This request is usually accompanied by a more or less veiled intimation to the manufacturer that his sales to the company in question will fall off if he does not assent to the proposition. The result is that if he is supplying apparatus to the road, he is mulcted for sums which, though individually small, aggregate a large amount. He may, and usually does, realize that this advertising is absolutely of no direct value to him, but if his business with the railroad company is large, or if he hopes that some day it will be, he is generally afraid to decline. The officers of the company actually responsible for the purchases may know nothing about the publication and usually would be in no way influenced by the question as to whether the manufacturer was "represented" or not, but their names are used with great freedom on the stationery and other literature employed to convince the manufacturer that he ought to patronize the advertising pages of the publication in question.

Those of our readers who are not familiar with the newspaper business may not know that during the last five or ten years there has been a great advance in the methods of advertising. This has been due both to the great advance in technical and general publications and also the fact that associations such as the Technical Publicity Association and the Association of American Advertisers have been formed among manufacturers to investigate for themselves the circulation and standing of advertising mediums used by their members and to determine the value of their advertising

pages. This movement has been fought by publishers whose patronage in the past has been secured on sentimental grounds or by vague claims as to circulation, but has been met in the proper spirit and encouraged by the leading technical papers and magazines which have been willing and anxious to do business on a business basis. The consequence is that advertisers are very much wiser than they have been in the past, and when the program or other sporadic nuisance is brought to their attention as an advertising medium they recognize its uselessness more clearly than they might have done five or ten years ago.

Another objection to publications of the kind which we have been considering is that they establish an unfair competition with independent technical papers. It is well known that most manufacturers appropriate a certain amount of money for advertising purposes, and what is given to one publication for sentimental or other reasons is often withdrawn from another which is of real value in the field. The right kind of a technical paper is not afraid of fair competition; indeed it welcomes it, but every paper or publication which does not give its advertisers value received for their money is a parasite in the newspaper business. It is supported entirely at the expense of the legitimate papers in the field, which are in consequence prevented by just so much from the usefulness of which they are capable.

We do not mean to say that programs and publications of a similar kind ought to be debarred from all advertising. We can easily conceive that local tradesmen selling clothing or groceries directly to the employees of a company might find it of value to advertise in a company organ or publication having a circulation among these men, but that there is any real value in such publicity to a manufacturer of engines, generators, cars or other large apparatus is preposterous. The solicitation of such business by railroad companies or their officials, or by any association under their patronage, is, to say the least, derogatory to their dignity.

The Subway Controversy

Recurring to the Sprague-Stillwell discussion on the equipment of the Subway, we are glad to note that the differences between these capable engineers are more of degree than of kind. Mr. Sprague's call for the determination of such schedules and maximum speeds as will give maximum capacity with the greatest degree of safety is one the wisdom of which no one will dispute. We have no doubt that, as Mr. Stillwell says, this course was followed, but every year adds new light on rapid transit, and the problem of maximum capacity involves operative factors which cannot be predetermined from electrical data, especially when practical safety in operation is considered. As the service is quickened a point is reached beyond which increase of speed involves altogether disproportionate increase of risk. The fundamental thing in safe operation is that a moving train should always and everywhere be under such control as will enable it to be stopped in time to avert collision. The dangerous space defined by the distance required to stop depends in the last resort upon the speed and weight of train and the braking facilities, quite independent of the length of the blocks. The handling of the schedule must take this into full consideration, and until this has been done there will continue to be accidents. We think that Mr. Sprague's insistence upon uniform trains which can be handled with exact uniformity is a position well taken from this point of view. It does not necessarily follow, however, that all cars should be motor cars. The requirement of uniformity alone can perfectly well be met by a train drawn by a locomotive, and while the use of motor cars only somewhat simplifies making up uniform trains, it is an open question whether this gain is not fully paid for by extra care and maintenance of equipment.

This indeed is the point at which Mr. Sprague and Mr. Stillwell part company, the former insisting that nothing short of his full multiple unit control will answer the purpose, and the latter taking a polite but firm negative. Between the two we should hesitate to take sides without an exhaustive personal study of the engineering problems of the Subway. The main question is whether the acceleration necessary to secure maximum capacity can be smoothly applied without resorting to a complete motor-car equipment, bearing in mind that acceleration cannot be pushed too far without serious danger to the line load. This is a question of fact, and with this limitation the simpler the motor equipment the better. The incidental advantages of multiple unit control, such as facility in splitting up trains at branches, have not yet amounted to much in practice, whether from mere inertia in railway management or from inconvenient complication we cannot say.

We do not attach much importance to the advantage claimed in emergency braking with the motors when all cars are motor cars, for in nineteen cases out of twenty this method is not resorted to until too late, if at all. By the time it is certain that the regular brakes will not work no brake will avail much if trains are on short headway. How far control, and especially braking control, should be automatic is rather an open question. As regards smoothness of stopping and starting, it is surely an advantage. In emergencies any automatic device that requires a second's thought to replace by full manual control is an element of danger, and the usefulness of the scheme depends on the perfection with which operating details are worked out.

The main faults of the Subway lie outside the electrical equipment proper. If the cars were more easily accessible, and the tunnel were properly ventilated, or indeed half ventilated, we fancy that well-founded complaints would be few indeed. The difficulties of air supply and disposal of the heat generated during operation are so grave as to constitute a formidable objection to the building of subways in any form now in use.

A Standard Wheel-Tread

The street railways of the country occupy very much the same position in regard to all standards that the steam railroads do relative to those of the American Railway Master Mechanics' Association. There is, it is true, no interchange of traffic, so that no road is called upon to repair the rolling stock of a connecting line, as in the case of steam roads. But there are other pecuniary reasons in favor of uniformity, because where this obtains it is possible to manufacture at a less cost, with the result that the consumer pays a lower price. Up to the present but little has been done, as there have been other things of more pressing importance to require

attention, so the street railway companies have followed the course of the steam roads, on which there was a delay of forty years before standards were adopted. But that there is an appreciation of the importance of the matter is shown by the appointment of committees by the American and Engineering Associations to handle the subject, and we are glad to note from the circular just issued, and published in the last issue of this paper, that one of the first things to be considered is that of standardizing the wheel tread and flange.

That this is important is evident by the fact that there is a wide variation in the practices of the different roads, by which wheel makers are obliged to maintain a large number of wheel patterns and chills for cast wheels, and either do the same in the case of the tires for steel wheels, or else turn the flange to the required shape at the expense of time and money. All of these investments and cost must be paid for and, in the final accounting, it is the street railway company that pays the bill. As to just what the total number of patterns of wheel there are in use in this country, there is no means of ascertaining, but if all of the variations of flange were to be multiplied by all of the variations of tread width and this again by the number of dishes of the hub, we would have a possible total that would be well up in the hundreds and absurd in the variety that is offered.

That a remedy is needed there can be no doubt, and that it is difficult to find and apply is equally evident. First of all there are the municipal regulations as to grooved and side bearing rails usually made by municipal engineers who have little or no appreciations of the running requirements. This has compelled many roads to use a rail and wheel tread that do not meet with the approval of its officers. In other cases a tread and flange has been designed by a master mechanic to meet his own ideas of what is best, without, perhaps, any really thorough investigation as to what is most suited to his own requirements, and so this heterogeneous practice, under which we are now laboring, has grown up. Of course where municipal requirements are such that they can be met only by the peculiar tread and flange in use, no discussion of standards is in order, as yet. But where there is a free hand to act, the subject is a live one.

Recognizing this, let us see what steps it will be advisable for the committee on standards to take in the designing of the wheel tread and flange.

First of all, the intimate relationship between the wheel and the rail must be considered. This calls for a careful investigation of the subject jointly by the car and track departments. For years we have had many theoretical discussions as to just what may be the best forms of curves for the flange and the rail head. A large number of reports of observations have been made, but with them all there are still wide differences of opinion as to the best forms to use. Should the root of the flange be struck with a long or short radius? Should it conform to the head of the rail or not? Should the tread be straight, or tapered? If tapered should that be on the ratio of one in fifteen, twenty or twenty-five. One can take his choice, and for that choice he may be very sure that he will pay money. Years of experience has led to some approximation as to what is best. It seems to be fairly well proven that a tread taper of one in twenty is better than one that is flatter, and that the side of the rail head should slope rather than be vertical. Hence the rail man should be called in to see what he can and will do before the wheel man reaches his decision.

Now as to height and thickness of flange. Should the former be ¾ in., ⅞ in. or 1 in. for city service? At what maximum speed can a low flange be depended upon to keep the car upon the track? What is the tendency of wheels with flange roots of various radii to climb the rail? What are the pressures put by the flange upon the rail on curves and tangents? These are questions that should be answered because upon almost every urban line there is more or less country running to be done, and it is well to know what can or cannot be done before taking a step that is to be blindly followed in its recommendations in so many respects.

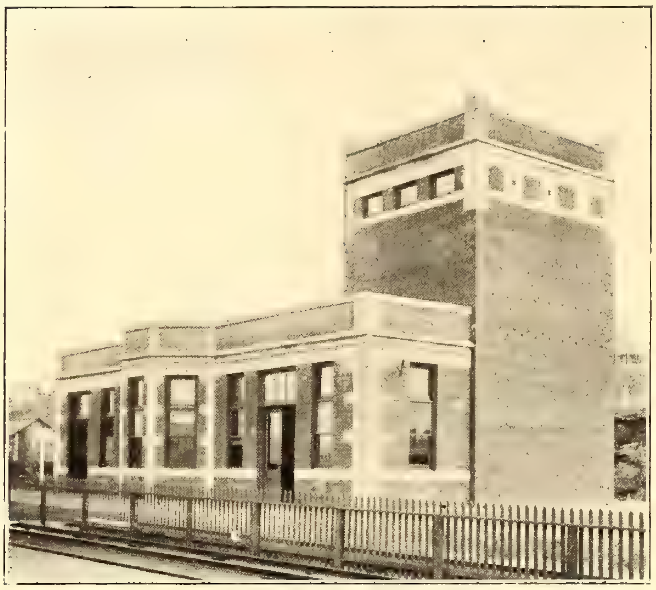
Then how strong need the flange be? On this we are absolutely in the dark, but there is a prospect that in the near future some light may be thrown upon the subject. Current practice has followed precedent established by the rule of thumb with remarkably good results, but it would be well to know whether this precedent has established dimensions that are all that they should be or not. In this the steel wheel, of course, far outranks the cast-iron one as to strength, but how about wear? Will a flange shape that will give the best results on cast iron also give the best with steel?

Finally, in the shaping of the flange what shall be the contour of the crown? It seems to be the almost universal practice among street railroads to use a crown that is the arc of a circle, rather than a gothic arch such as that adopted as standard by the Master Car Builders' Association. The reason is to be found in the peculiar condition of switch and cross-over work, where the wheels are called upon to carry the load of the car on their flanges. In many, if not in most cases, the cross-over is deliberately made with such a shallow flangeway that, for some time after it is laid, the surface is protected from all wear by the flange carrying the wheel and lifting the tread clear of the rail, until a groove has been worn in the special work. This prolongs the life of the track, but how about the wheels? Will the metal saved in the crossing pay for the wheels that are discarded on account of chipped and broken flanges? These are conditions that must be faced by the committee engaged in the formulation of a recommendation as to wheel flanges.

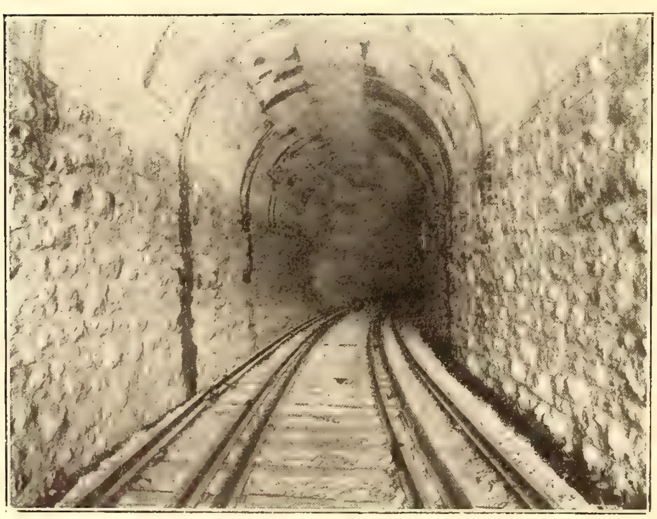
There has been no desire, in what has been said, to make a mountain out of a molehill, but merely to call attention to a few points that should be considered in the development of this standard. No questions have been asked that patient and thorough investigation cannot answer definitely and finally; nor have any been asked that do not seem to be deserving of an answer. With the data at hand, that this work would give, a form of tread and flange and rail head can be designed that will have the weight of authority, and this will be backed in a way that will compel municipal authorities, that now impose burdensome restrictions upon the railroads within their limits, to remove such restrictions and permit the use of wheels and rails that will not only give better satisfaction to the public but decrease the cost of purchase and maintenance to the operating companies. On the other hand, if this is not done, and the municipal engineer is allowed freedom to dictate any peculiarity in rail which strikes his fancy, the position of the street railway companies will remain unchanged and modifications of practice can only be brought about by the slow methods now in vogue.

OPERATING DETAILS OF THE LACKAWANNA & WYOMING VALLEY RAILROAD

In the STREET RAILWAY JOURNAL for June 13, 1903, an account was published of the system of the Lackawanna & Wyoming Valley Railroad, the high-speed third-rail line extending from Scranton to Wilkesbarre, Pa. This line possesses the unique distinction among interurban electric railways of operating for its entire length over its own right of way, and of owning handsome stations in each terminal city, as well as several at way stops. In other words, its operating conditions are similar to those of a steam railroad, except for its motive power. The construction of the line was thoroughly described in the issue already referred to, and has subsequently been treated in detail in papers by the constructing engineers and others presented before engineering bodies, particularly in a paper read by George B. Francis to the Boston Society of Engineers. The road was built by Westinghouse, Church, Kerr & Company, and is still largely owned by the Westinghouse interests.

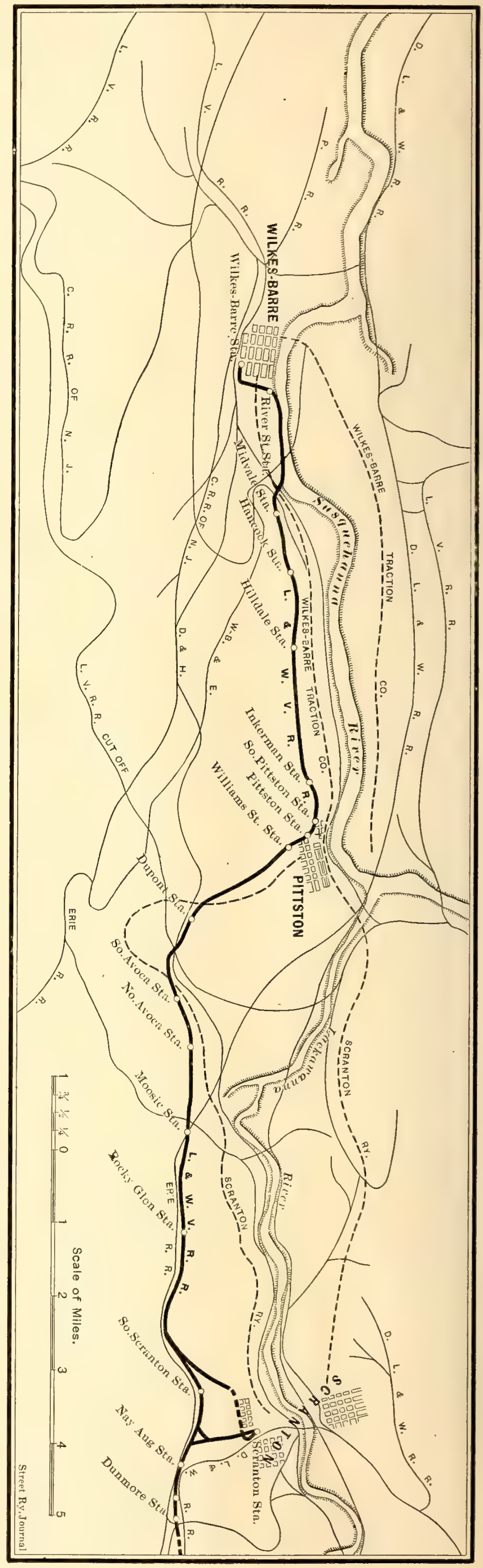


SUB-STATION AND PASSENGER STATION



VIEW IN TUNNEL FROM NORTH PORTAL

The article in the STREET RAILWAY JOURNAL already referred to describes the line practically as it is to-day, except that the company has recently completed a tunnel which cuts



MAP OF THE LACKAWANNA AND WYOMING VALLEYS, SHOWING ROUTE OF LAUREL LINE AND OTHER RAILWAYS

off considerable distance between Scranton and Wilkesbarre. This tunnel is 4747 ft. in length, from portal to portal, and and 22 ft. high, from sub-grade to the top of the arch. There is a grade in the tunnel of 1 per cent.

FRONT OF SCRANTON TERMINAL STATION

SCRANTON TERMINAL STATION, FROM YARD SIDE

trains were run through it for the first time on Oct. 19, 1905. The cost of the tunnel was about $600,000. The track is elevated 2 ft. above the sub-grade. The tunnel is 17 ft. wide,

In spite of the many articles on the construction of the line, little or nothing has appeared in regard to its operation, although the special conditions already mentioned, and the fact

that the company is incorporated under a steam railroad charter, makes these features of especial interest.

The terminal cities are 20 miles apart. Scranton has a population of about 120,000 and Wilkesbarre of 80,000. The intervening country is fairly well settled. The largest city between Scranton and Wilkesbarre is Pittston, which is about half way between the two termini and has a population of about 30,000.

STATISTICS ON TRAFFIC

At first sight the outlook for an additional road extending from Scranton to Wilkesbarre would not seem promising. On account of the anthracite coal deposits, the Wyoming and Lackawanna valleys have probably more lines of track than almost any other section of the country of equal area. There are altogether seven steam railroad lines extending into the district, and most of them traverse its entire length. These roads are the Pennsylvania Railroad, the Erie Railroad, the New York, Ontario & Western Railroad, the Delaware, Lackawanna & Western Railroad, the Central Railroad of New Jersey, the Delaware & Hudson Railroad and the Lehigh Valley Railroad. There are also two trolley lines connecting Scranton and Pittston, one on each side of the river, and two between Pittston and Wilkesbarre. The steam railroads mentioned were built, of course, principally

ONE OF THE VIADUCTS ON THE LINE

GENERAL VIEW OF POWER STATION, CAR HOUSE AND TRACKS NEAR SCRANTON, OF LACKAWANNA & WYOMING VALLEY RAILWAY

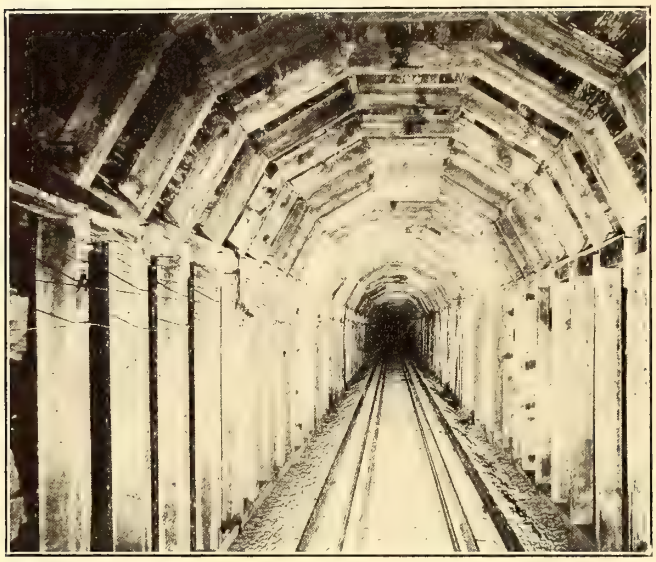
on account of the coal deposits, and only two have aimed to do a passenger service between the two cities under consideration, Scranton and Wilkesbarre. These two railroads are the Delaware & Hudson, whose terminals are well located for passenger traffic in both cities, and the Delaware, Lackawanna & Western, whose Scranton terminal is well situated, but whose Wilkesbarre terminal is about a mile and a half from the center of that city. Consequently, before the advent of the high-speed line, the Delaware & Hudson Railroad got most of the business, except that which went by trolley.

The fare charged by the steam railroads of the vicinity before the Lackawanna & Wyoming Valley Railroad was opened in 1903 was 3 cents per mile, and some concessions from this rate were made when mileage books and commutation tickets were purchased. The Lackawanna & Wyoming Valley Railroad decided that it could carry passengers for 1½ cents per mile on single tickets and 1¼ cents per mile on excursion tickets and mileage books. The last are sold in books containing 250 and 500 miles. At these rates the single-ticket fare between Scranton and Wilkesbarre is 30 cents, and the round-trip fare 50 cents. Shortly after it opened its line for traffic a material reduction was made in the steam railroad rates, and this was followed a little later by another. Although the steam railroad rates are and have for some time been lower than those charged by the Lackawanna & Wyoming Valley Railroad, no effort has been made to meet the former. The electric line has considered its rates to have been carefully and fairly determined, and has depended upon its service to win business. No statistics are available as to the division of traffic between the competing steam and electric lines, but careful local estimates place it at about 80 per

PASSENGER STATION AT ROCKY GLEN

WILKESBARRE TERMINAL STATION, FROM YARD SIDE

cent for the electric line and 20 per cent for the steam lines, with the through traffic via the trolley lines practically negligible. It is interesting to add that the steam lines are carrying more passengers than before, thus showing that the ad-



TIMBER SECTION OF TUNNEL

vent of the electric line has created a very considerable traffic.

The following statement, showing the car mileage of the Lackawanna & Wyoming Valley Railroad by quarters for the

PITTSTON PASSENGER STATION

years of 1904 and 1905, indicates the increase of the company's business:

Quarter	1904			1905		
	Passenger	Freight	Total	Passenger	Freight	Total
First	229,655	12,506	241,161	286,098	12,965	299,063
Second	257,341	13,146	270,487	319,387	15,967	335,354
Third	338,821	16,371	355,192	390,437	17,768	408,205
Fourth	304,872	13,016	317,888	339,355	16,489	355,844
	1,130,689	55,039	1,185,728	1,335,277	63,189	1,398,466

CREATION OF TRAFFIC AND SCHEDULES

The greater part of the business now enjoyed by the company has practically been created by the supply of good transit facilities. The other transportation lines between the cities, as stated, carry as many, if not more, passengers than before, but the existence of a high-speed line between the two cities has undoubtedly caused many people to travel who would not have done so otherwise. Part of this is pleasure traffic, or is induced by the pleasure resorts along the line. The greater portion, however, is twelve-month business. Thus a great many shoppers travel on the line, although Wilkesbarre and Scranton are of nearly enough the same population, so that there is no very marked difference between the shopping facilities in each place. Nevertheless, critical buyers have discovered, or have thought that they have discovered, that certain articles can be purchased better in one city and others in the other, and these shoppers make up a considerable bulk of the day's business. Theatrical parties, or atendance induced by attractions in one or the other city, contribute to the traffic. In fact, the experience on the Lackawanna & Wyoming Valley Railway shows that the residents of two cities 20 miles apart, of about 100,000 population each, and connected by an attractive and high-speed line, with low fares and frequent trains, can find many excuses for traveling from one city to the other

When the company commenced operations in May, 1903, it ran a twenty-minute local service from 6 a. m. to 12 p. m. In December, 1903, additional local trains were scheduled, producing ten-minute service from 3:20 p. m. to 6:40 p. m. daily except Sunday. In February, 1904, a limited train service, stopping only at Pittston and terminals, was instituted with five trains in each direction, daily except Sunday. In June, 1904, an all-night service was put on with hourly

TYPICAL CUT ON LINE

local trains from 12 midnight to 6 a. m. In June, 1905, the limited service was increased to thirteen trains in each direction daily except Sunday.

The company's present schedule between Scranton and Wilkesbarre includes limited trains or cars each way every hour between 7 a. m. and 7 p. m., and local cars every 10 minutes between 3:20 p. m. and 6:40 p. m., and every 20 minutes between 5:40 a. m. and 3:20 p. m., and between 6:40 p. m. and 12 midnight. Local cars are also run every hour from 1 a. m. to 5 a. m. In addition, there are five freight and express trains run each way during the day.

SOLICITING TRAFFIC

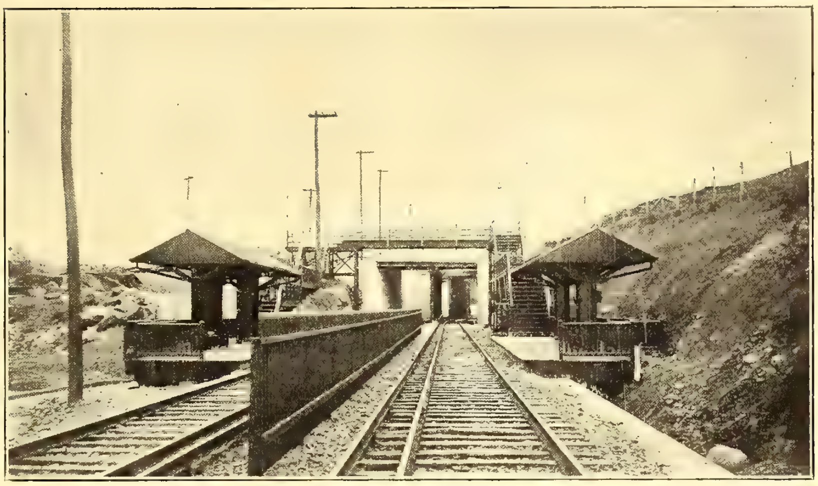
The passenger organization, as already described, is conducted along steam railroad lines by an experienced traffic

manager. Although the line is only 20 miles long, the company believes in advertising extensively in the daily papers. These advertisements take two forms. One is the standard time table, similar to that carried by the steam railroads. This is published not only in all the daily papers in the two terminal cities, but also in a considerable number of local papers, which are issued less frequently. In addition to this newspaper advertising, the company uses special announcements, and has arranged with the editors by which some of these announcements appear in the reading columns. One plan, which has proved very popular and which has been conducted for the last two seasons, is the publication of a set of jingles on the advantages of the "Laurel line," which is the popular name of the road. These jingles were known as the "Nifty Bill" jingles, and a new verse was published each day in each paper in which the company advertised. As this campaign was conducted for three months during the past two summers, the brain of the poet was somewhat taxed in an effort to produce 180 verses. But he succeeded, and it was found that people came to look each day to see what "Nifty Bill" had to say. Two of these verses are appended to illustrate their general character.

"How old is Ann?" the doctor said;
Cried Nifty Bill: "I've never read
The lady's age, but know, instead,
The wonders of the Laurel Line."

"The reason there's no dust, they say,
Is rock-ribbed ballast all the way,
And oil besides," said Bill, "to lay
The dust along the Laurel Line."

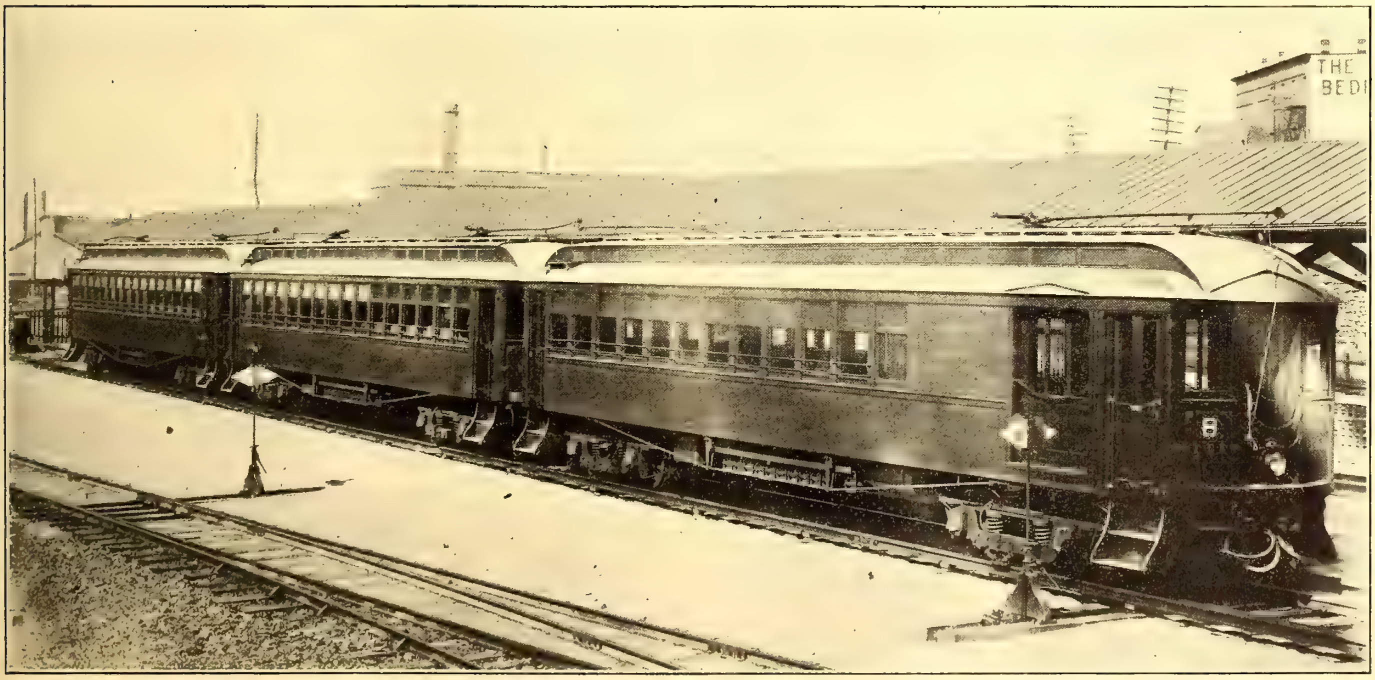
Newspaper advertising is not the only kind of missionary work upon which the passenger agent depends for developing traffic. The company issues a number of traffic circulars, and when it first commenced business distributed a very handsome circular, which was prepared by the Matthews-Northrup Company, and of which 10,000 were printed. The large covers of this circular, which was printed tastefully in colors, were framed and presented to different hotels and other places in the cities along the route. A standard time table is issued for passengers' use, and is very similar to those employed by steam railroads, except that it is printed in two colors. In addition, the company has two outside men to solicit business and has issued various advertising souvenirs, such as lapel buttons and ladies' hat pins. These souvenirs are distributed by the ticket agents and the outside men. Ticket agents are employed regularly at four stations, viz., Scranton, Pittston, Hancock and Wilkesbarre.



TYPICAL WAY STATION

TRAFFIC AGREEMENTS WITH OTHER ROADS

The company has traffic agreements with other roads in the Eastern Railway Association, and sells through tickets and checks through baggage, just as steam railroads do. It also interchanges freight with the Erie Railroad, the Delaware, Lackawanna & Western Railroad, and the Lehigh Valley Railroad, and expects to haul through steam railroad passenger cars for certain of the steam railroad lines, which reach one of its terminals and not the other.



STANDARD THREE-CAR TRAIN

FREIGHT AND EXPRESS SERVICE

The company has leased the express business on its line to the Adams Express Company, and is one of the very few electric railways whose express business is conducted by one of the old line express companies. There are five express runs each way by special express motor car. In addition, freight cars are hauled over the line by a steam locomotive owned

STANDARD CAR

by the company, but this steam locomotive has recently been replaced by an electric locomotive. The company has the same freight rates and schedule as the steam railroads, and employs freight agents at each of the principal stations.

ELECTRIC LOCOMOTIVES

Two views are given of the electric locomotive used by the company for hauling freight trains. It is of the Baldwin-Westinghouse 8-4-E type, weighs 55 tons, and its principal dimensions are: Length over all, 32 ft.; width, 9 ft.; truck

SIDE VIEW OF LOCOMOTIVE

centers, 15 ft.; wheel base, 7 ft. 10 ins.; wheels, 36 ins. in diameter. The locomotive is equipped with four 50-hp motors and automatic air brakes and is also arranged for multiple-unit switch control. It is fitted with both trolley and third-rail shoes.

TELEPHONES AND DESPATCHING

All despatching is conducted by telephone, and Couch & Seeley instruments are used. The despatcher is stationed at Scranton, and the company uses a modification of Nos. 19 and 31 of the Standard American Railway Forms, as shown on page 170, except that the instruction is sent by telephone instead of telegraph. The conductor is required to write the train order as received by the despatcher on an autographic

MILK CAN USED FOR HOLDING CALCIUM CHLORIDE

register, which makes three copies. He then repeats the order to the despatcher, and marks the time of its receipt. Two copies are then torn off from the register; one is kept by the conductor and the other is handed by him to the motorman. The third is retained within the register.

THIRD-RAIL CONSTRUCTION

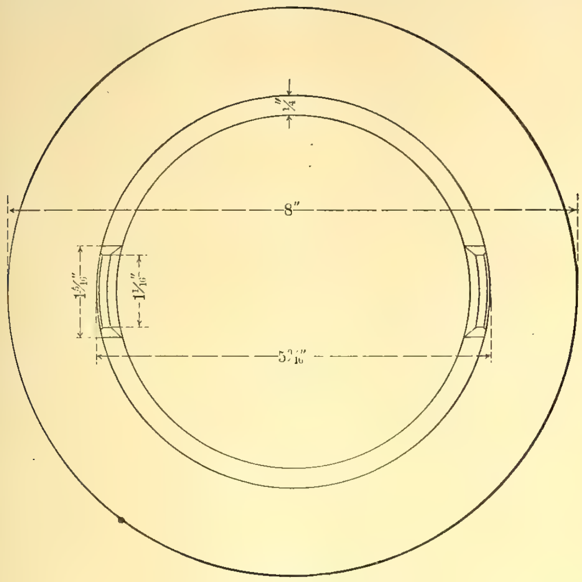
The company was one of the first to use a side third rail,

END VIEW OF LOCOMOTIVE

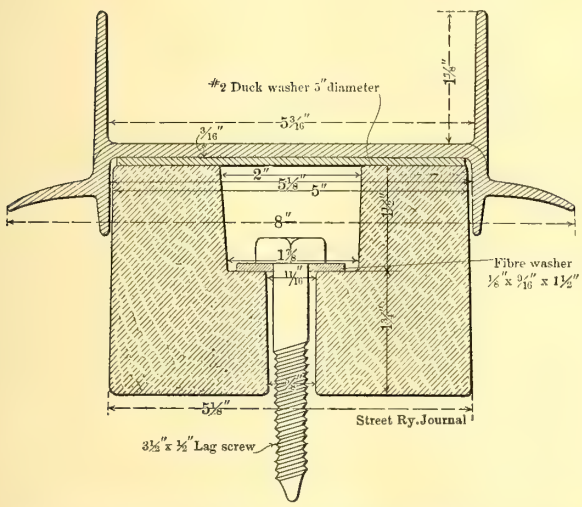
and has made little change in the character of rail or insulation. The rail is mounted 19⅛ ins. center to center from the service rail and its head is 3 ins. above the head of the service rail. The rail used is a 75-lb. A. S. C. E. section. Several types of insulators have been employed, including reconstructed granite and several types of earthware. Experiments are also to be conducted with insulators made of oak and painted with P. & B.

SLEET REMOVAL BY CALCIUM CHLORIDE

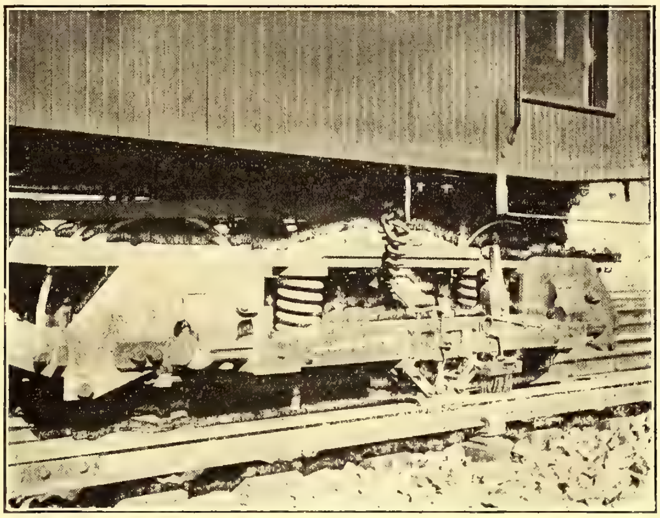
For cleaning ice off the third rail the company uses brushes and a weak solution of calcium chloride. The cars always run in the same direction and the forward truck is equipped with a wire brush. The handle is hollow. The calcium chloride solution is carried in a 15-gal. milk can in the motorman's cab, and is connected with the hollow handle of the brush on each side of the truck by ¾-in. piping. The flow is controlled by small globe valves. The cans are carried only when the weather requires it, and a very small quantity of fluid only is needed. The rear truck is equipped with a standard Hedley third-rail scraper, which consists of steel-plate spring brushes held in a flat back, and bearing on the head of the rail, diagonally across its face. This scraper removes the ice or sleet, which has been softened by the calcium chloride applied by the leading brush.



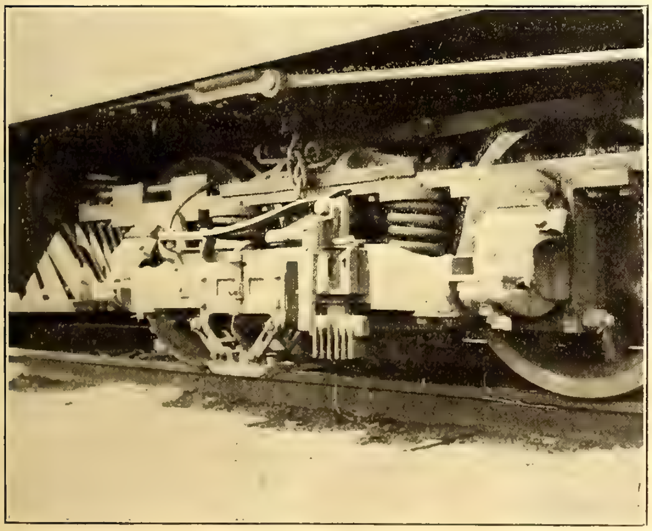
Top View of Malleable Iron Cap.



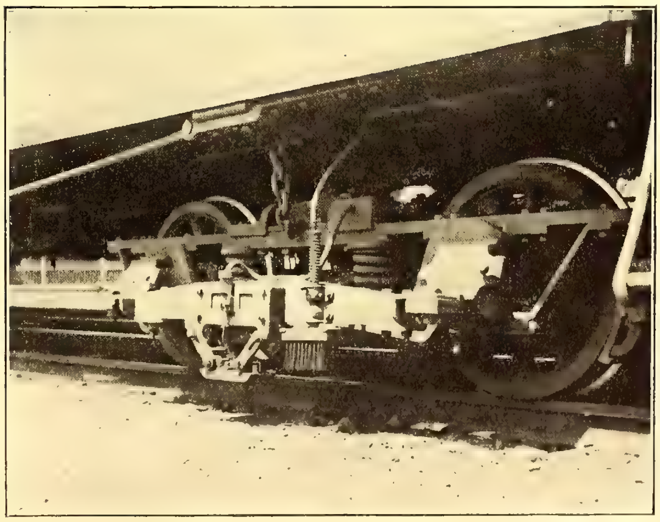
PLAN AND SECTION OF THIRD-RAIL INSULATOR



BOSTON ELEVATED WIRE BRUSH FOR SLEET, USED ON FORWARD TRUCK



HEDLEY SLEET SCRAPER ON REAR TRUCK



OHIO BRASS SLEET WIRE BRUSH, USED ON FORWARD TRUCK, SHOWING ALSO PIPE FOR CALCIUM CHLORIDE

BRAKE-SHOES

A large number of experiments have been conducted on brake-shoes. The company first used a very soft brake-shoe, which wore out very rapidly. This was followed by a hard brake-shoe, which cut the tires badly. The company has now adopted the Diamond-S shoe as standard.

PARK RESORTS

The company has developed a large park business, and has on its line an unusually large number of very attractive parks, especially Luna Park, near Scranton; Rocky Glen Park, 6 miles south of Scranton, and Valley View Park, half-way between Pittston and Wilkesbarre. The latter is controlled by

the company, the others by outside individuals or corporations. At Valley View Park no admittance is charged, except when the park is leased for the day, as it frequently is, to some society or association. In this case, the latter has control over the admissions. The park contains base ball grounds, five booths for the sale of refreshments, dancing pavilion, swings, seats, band stand, etc. Last season the company provided band concerts every Sunday afternoon and evening, at which bands of thirty pieces from Wilkesbarre and Scranton played on alternate weeks. The average attendance was from 4000 to 5000, and the park has frequently entertained 12,000 persons. The land was leased for a long term of years at a nominal rental, and as the natural attractions were excellent only about $5,000 was required to fit up the park, not including $2,000 which was spent on the baseball and athletic grounds, so that the investment is not large, although the returns are very satisfactory.

ACCOUNTING

As the company is organized under the steam railroad law, it is obliged by the Commissioner of Internal Affairs, at Harrisburg, to conduct its accounts after steam railroad methods. The steam railroad form is, therefore, followed, with the addition of some eight or ten accounts not used in steam railroad work. Thus, in "maintenance of way," the company has an additional item, "maintenance of electric lines." In "maintenance of equipment" the company also has a charge of "maintenance of steam and electric plants." The "passenger car" item is credited with all the expenditures put on the cars, except those required for the electrical equipment. The expense of the crews on the freight cars is charged in to freight service. The passenger motormen expenses are carried in a separate item and the same is done with the passenger conductors. The general expenses are the same as with a steam railroad, and the accounting with agents is also conducted on the same plan.

Lackawanna & Wyoming Valley Railroad Company.

TELEPHONIC REPORT OF ACCIDENT.

To the Superintendent

Reported by ______ Occupation ______ From ______

Train or Run No. ______ Engine or Motor No. ______ Cars Nos. ______ Direction ______

Conductor ______ Badge No. ______

Motorman or Engineman ______ Badge No. ______

Exact place of accident ______ Time ______

Number persons injured? ______ Passengers ______ Employes ______ Travellers on Highways ______ Trespassers ______

Names of injured persons | Occupations, if employes. | Addresses

Apparent injury ______

What was done with and for injured persons? ______

If Physicians were called, give names and addresses ______

Where are injured persons now? ______

Cause of accident ______

Damage to property ______

Name of owner ______ Address ______

Witnesses ______ Addresses ______

What tracks are obstructed? ______ Which can be cleared first? ______

Is wreck train needed? ______ From which end can wreck train work to best advantage? ______

Is Engine or Motor off track? ______ Damaged? ______

In what position? ______

How many loaded cars are off track? ______ How many damaged? ______

How many empty cars are off track? ______ How many damaged? ______

How many and kind of cars needed for transfer of freight? ______

How many cars ahead of cars wrecked or off track? ______

Brief statement of how accident occurred ______

______ Dispatcher ______

TELEPHONE REPORT OF ACCIDENT

ACCIDENT RECORDS

The company pays more attention to accident records than most roads. These records are kept in vertical file cases, which contain, respectively, in three divisions, settled cases, those in suit and those for which no suit or claim has been brought. The accident record itself may consist of eight sheets. The first is the first news of the accident received at the main office. This word usually comes by telephone to the train despatcher, who fills out this blank, as soon as the accident is reported to him. As this is a novel idea, the blank used for this purpose is reproduced. The second sheet contains the conductor's report of the accident. This blank is filled out by the conductor as soon as he reaches one of the terminal stations, and it gives the particulars more in detail. The third blank is the motorman's report, and describes the condition of the car or train, its speed, whether all lights were burning, etc., and contains a space for his account of the accident. The fourth blank is the one filled out if the victim of the accident is an employee. It gives particulars of the accident and is signed by the injured person, foreman and all others who were witnesses. The fifth is the surgeon's report, and must be filled out and forwarded by the surgeon, immediately after attendance, to the superintendent. All of these blanks contain forms for making sworn acknowledgements of their statements before a notary public—a precaution that is usually taken. The sixth and seventh blanks are the more complete reports of the conductor and motorman, which are in the form of affidavits, and the eighth is a statement filled out by the witnesses. The blanks, when collected after an accident, are enclosed in a stiff manila cover with blank lines on the outside, where the information can be digested, and are bound up with any other papers that may relate to the accident. All accidents are numbered, as far as possible, in chronological order, and each is given a mark on the outside to indicate its classification, according to the plan

LACKAWANNA & WYOMING VALLEY RAILROAD COMPANY.

DAILY SUB-STATION REPORT.

190

Time	In Service: Transformers 1	2	3	4	5	6	Rotaries 1	2	3	D. C. Voltage	Output: Kwhr. Prev. Hr. – Diff. X .6: Wattmeter	Difference	Kwhr. Previous Hour	Circuit Breaker Record: Breaker	Time: Out	In	Open	Cause if known
A. M. 1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
Noon																		
P. M. 1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
Midnight																		
Total																		

Sub-station attendants will report in full on back any unusual occurrence, accident to apparatus or repairs required.

SUB-STATION ATTENDANTS

From ______ M. to ______ M.
From ______ M. to ______ M.
From ______ M. to ______ M.

Approved ______ Chief Engineer.

SUB-STATION REPORT, 9½ INS. X 12 INS.

LACKAWANNA & WYOMING VALLEY RAILROAD COMPANY.

DAILY ENGINE ROOM REPORT.

190

Time	In Service: Main Units 1	2	3	Exciters 1	2	Pumps: Cir.	Air	House	Transformers 1	2	3	4	Pressures: Vacuum	Receivers 1	2	3	Steam	D. C. Voltage	Output: Main Units: D. C. (Kwhr. Prev. Hr. – Diff. x .6): Watt Meter	Difference	Kwhr. Previous Hour	A. C.: Watt Meter Kwhr.	Kwhr. Previous Hour	Total Kwhr.
A. M. 1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								
11																								
Noon																								
P. M. 1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								
11																								
Midnight																								
Total																								

ENGINEMEN

From ______ M. to ______ M.
From ______ M. to ______ M.
From ______ M. to ______ M.

Approved ______ Chief Engineer.

FRONT OF ENGINE-ROOM LOG, 9½ INS. X 12 INS.

followed by the Pennsylvania State Railroad Commission. If suit is brought, the file is transferred to another file called the suit file, and when settled the papers are transferred to another file containing settled cases.

BULLETIN ORDERS

All bulletin orders are written in triplicate, and one copy is sent to the bulletin board at each terminal. A third is kept in the trainmaster's office, where it is pasted in a large book. Underneath the space left for the bulletin, the following words are printed:

I hereby certify that I have read the above Bulletin Order No. ...., on the date opposite my name, and that I fully understand same and agree to be governed thereby.

Underneath this clause is a space for signatures, and each man affected by the order is required to sign his name on the page.

BLANKS AND FORMS

No attempt can be made to publish or describe all of the blanks and forms used by the company, but those used in keeping track of accidents have been mentioned, and certain others showing the performance of the apparatus used have proved so satisfactory, that a brief description will be given of them.

The company's three log sheets for the engine room, boiler room and sub-station are presented herewith. The principal feature of these logs is that no attempt is made to keep a record of prices at the power station Instead, the chief engineer fills out the mechanical information required, leaving the accounting for the head office. Only one side of the engine-room log is reproduced. The other side has a record of circuit breakers in and out, remarks, and switchboard attendants. No daily record is kept of oil used, as the company has a contract for the supply of all the oil required at a maximum cost per 1000 kw-hours of station output. The coal record is kept by weighing the coal when delivered, and taking an estimate of stock at the end of the month. More exact methods are not required, as the line is in the region where coal is cheap, and no large supply has to be kept on hand.

All of the other performance records are kept on cards, either 5 ins. x 8 ins., or 3 ins. x 5 ins.

FORM 115 800-3-'06

L. & W. V. R. R.

Tire No ..... Size ..... Kind .....

Center No.	Axle No.	On Centre	Turned or Off	Amount Turned	Mileage

TIRE RECORD, 3 INS. X 5 INS.

MADE BY .....

UNDER CAR			MILEAGE	REMARKS
No.	From	To		

BACK OF TIRE RECORD, 3 INS. X 5 INS.

The heading of the paint and varnish record is shown in Form 113. This is self-explanatory, except to say that the dates on which cars were painted are written in red ink, and those on which cars were varnished are given in black ink. This same form can be used to record progress of any special tests, i. e., on armatures, etc., when desired.

Form 111 is used for the tabulation of different kinds of troubles. Six classes of troubles are kept on this card, viz., troubles with air-brakes, type-L control, electro-pneumatic control, trucks, motors and car bodies. The card is ruled off for 31 days. In addition, a card is kept for entering the number of defects which are reported, but which, upon examination, are found to be O. K.

Form 112 is the mileage record. A separate card is kept for each car.

The only supply parts which the company uses in sufficient quantities to warrant special records are brake-shoes and tires.

Form 113 200-3-'06

LACKAWANNA & WYOMING VALLEY RAILROAD COMPANY

No. ..... Record

Date In	Date Out	Remarks	Date In	Date Out	Remarks

PAINT AND VARNISH RECORD, 5 INS. X 8 INS.

Form 114 shows the card used in keeping brake-shoe records. This, like all of the other cards mentioned so far, is 5 ins. x 8 ins. After the words "Truck number" the card is filled in to show whether the shoe is on a right front-motor truck wheel, a right rear-motor truck wheel, a right front-trail truck wheel, etc. The cards when placed in the index are divided into eight divisions, to correspond with the eight car wheels. The first four columns on this card are used regularly. The items in the following four columns are kept only occasionally, viz.: when special tests are made of brake-shoes.

Form 112, 200 3-'06

L. & W. V. R. R.

Mileage Record ..... Car No.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

FORM FOR KEEPING MILEAGE RECORDS, 8 INS. X 5 INS.

LACKAWANNA & WYOMING VALLEY RAILROAD COMPANY.

DAILY BOILER ROOM REPORT.

WEATHER 190

TIME	IN SERVICE											
	BOILERS							FANS		FEED PUMPS		CONVEYOR
	1	2	3	4	5	6	7	1	2	1	2	
A. M. 1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
NOON												
P. M. 1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
MID-NIGHT												
TOTAL												

TIME	PRESSURES				TEMPERATURES								TIME
	BAROMETER	DRAUGHT		STEAM	OUT-SIDE AIR	BOILER ROOM	FAN DRAUGHT	FLUE GAS	FEED WATER		CONDENSER		
		AIR DUCT	CHIM-NEY						COLD	HOT	INTAKE	HOT WELL	
A. M.													A. M.
6													6
NOON													NOON
P. M.													P. M.
6													6
MID-NIGHT													MID-NIGHT

REMARKS

ENGINEMEN

..... FROM ..... M. TO ..... M.

..... FROM ..... M. TO ..... M.

..... FROM ..... M. TO ..... M.

APPROVED ..... CHIEF ENGINEER.

BOILER-ROOM LOG, 9½ INS. X 12 INS.

The tire record is printed on both sides of a card, 5 ins. x 3 ins., and is ruled with nine horizontal lines to give all the entries probable during the life of each wheel.

REPAIR SHOP RECORDS

In its repair shop records, the company pays especial attention to their possible use at any time as evidence in accident suits. It has been found that in a number of claims the plaintiff has alleged that a defective condition of the car has existed, and every care is taken to provide against this contingency. The first repair record may be considered to be that kept by the train master as a substitute for the usual signing in sheet. This consists of a report to the effect that Car No. .... is in good condition, with the exceptions noted, and must be signed by both conductor and motorman when leaving work. The items which the motorman approves are printed in one column in one font or style of type, and those which the conductor approves in another column and another font of type. This report is made with a carbon duplicate. Both sheets are checked by the despatcher against the train sheet. The original then goes to the master mechanic and the duplicates to the superintendent for his accident file. The master mechanic notes on the back of his sheet any remarks which are necessary, and places in his permanent file.

ARTICLE

DATE	NAME AND ADDRESS	CAT. NO.	QUANT.	LIST	DIS.	NET	REMARKS

PRICE RECORD, 5 INS. X 8 INS.

Every car is thoroughly inspected at the repair shop once in three days. When a car enters the shop a blue card is attached to it, carrying the following list of parts and repairs:

CAR NUMBER......... DATE IN........

Car Body:—
- Steps.
- Doors (checks, stops and fastenings).
- Window guards.
- Sash (glass and fixtures).
- Seats.
- Floors.
- Registers.

Trucks:—
- Brakes adjusted.
- Brake shoes.
- Truck bolts.
- Hand brakes.
- Sand boxes inspected and filled.

Motors Oiled:—
- Armature bearings.
- Motor-axle bearings.

Motors Cleaned:—
- Blowing out.
- Cleaning Fuller boards.
- Brush holders.
- Brush-holder springs.
- Carbons.

Air-Brake Equipment:—
- Compressors oiled and inspected.
- Motormen's brake valves.
- Conductors' signal valves and whistles.
- Slack adjusters.
- Piping.
- Connection hose.
- Governors.

Controllers and Lamp Circuits:—
- Switchboard.
- Controllers.
- Reverser.
- Lamp circuits.
- Storage batteries.
- Junction boxes.
- Jumpers.
- Jumper sockets.

Trolleys and Third-Rail Shoes:—
- Poles and wheels inspected.
- Wheels and bases oiled.
- Links.
- Bolts.
- Shunts.

The car number is then entered in a diary kept in the shop. This diary shows the number of the car in for inspection, and whether it was turned out O. K. at the end of the day or held in the repair shop for repairs. The different entries are comparatively few in number, so that for convenience they are stamped in the diary with rubber stamps. The blue card remains with the car while it is in the shop. It is hung on a hook in the cab. Train men have instructions never to take out a car which has a blue card on this hook unless all the items on the card have been completely checked off and signed for by the several inspectors. If so, the card must be turned in to the master mechanic before the car is taken out. If emergency repair work has to be done, a yellow card is used instead of a blue one. All of these cards, when returned to the master mechanic, are kept for two years, the time during which, under the law, accident claims must be brought.

Lackawanna & Wyoming Valley Railroad Co.

TRAIN ORDER NO.__________

Superintendent's Office, *Scranton, 20 Mar.* **190** *6*

To *C. & M.* **of** *No. 3 N.* **at** *Wilkes-Barre*

No. 3 N. will not pass Jenkins Crossover without orders. *C. P. W.*

CONDUCTOR AND MOTORMAN (OR ENGINEMAN) MUST EACH HAVE A COPY OF THIS ORDER.

Rec'd by *Land* **Condr. Made** *Comp.* **at** *1:16 p.* **M.** *Vicker.* **Dispr.**

FORM OF TRAIN ORDER USED IN DESPATCHING, MADE IN DUPLICATE

Form 111 900-5 06

LACKAWANNA AND WYOMING VALLEY RAILROAD COMPANY

Tabulation of .... Troubles 190

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total

FORM FOR TABULATING TROUBLES, 5 INS. X 8 INS.

Form 114 200-3'06

LACKAWANNA & WYOMING VALLEY RAILROAD COMPANY

Truck No. Brake Shoe Record

Make	Date On	Date Off	Mileage	Weight	Scrap Wt.	Wt. Wear	Miles per lb.	Remarks

BRAKE-SHOE RECORD, 5 INS. X 8 INS.

Another blank used for the car house is solely for preparing

defenses for accident claims. The company has sometimes had claims after an interval of several months for accidents, in which the plaintiff has alleged faulty condition of a seat, step or loose king-pin plate. As these parts are used as a basis for accident claims more frequently than any other, the company has found it desirable to use, in addition to the blue card, an inspector's report of each defect found which might possibly cause such an accident. For convenience in filing, these reports are made on blank paper cut 3 ins. x 5 ins. and filed by days in chronological order. They are kept for two years.

OFFICE RECORDS

A word might be said about a few of the office records. The lost and found department uses two cards. The first is a tag

Lackawanna & Wyoming Valley R. R. Co.

APPLICATION FOR EMPLOYMENT.

Applicant must answer questions and sign this application in ink *in his own handwriting.*

Name in full .... Married, Single, Widower.

Address in full ....

Position desired .... What is your trade or occupation?

Age .... Height .... Weight .... How long have you lived in ....

Where were you born? ....

If out of the United States, how long have you lived in this country? ....

Are you, or have you declared your intention to become a citizen of the United States? ....

When, where, and in what capacity were you ever employed by an electric, street or interurban, or steam railroad? ....

Why did you leave the service? ....

Where were you last employed, and in what capacity? ....

When, and why did you leave? ....

Are you in debt? .... If so, how much? ....

State what family you have, or what persons, if any, are dependent upon you for support and where they live ....

Are you subject to any sickness or infirmity? .... Are you in any way crippled or deformed? ....

Are you color blind or near sighted? ....

Have you any serious defect whatever in sight, hearing or speech? ....

Have you ever been injured? .... If so, when, where, how, and effect of injury? ....

Have you ever been convicted of any crime or misdemeanor? ....

Do you use intoxicating liquor? .... If so, to what extent? ....

Have you ever tended bar or conducted a saloon? .... Where and when? ....

Have you any relatives in our employ? .... If so, give their names and positions ....

To what surety company have you ever applied for bond? ....

Was bond granted? ....

State on the following blank your employment and employers during the last five years:

DATE FROM	DATE TO	EMPLOYED AS	NAME AND ADDRESS OF EMPLOYERS

I agree to submit to a medical examination by the Company's Surgeon and pay $2.00 for same.

In part consideration for my employment, I agree to deposit with the Company, without interest, the sum of $10.00 by way of liquidated damages and as a forfeit to insure the return of all property with which I may be intrusted and the making and verification by me of an affidavit containing a full and truthful statement of every accident affecting the Company of which I may have knowledge.

I agree that in case of my failure either to return any of the property instrusted to me, or to make affidavit as provided in the foregoing, the $10.00 deposited shall be forfeited to the Company but that it shall not be used as an offset against claim made for money owing by me for uniforms, or as against moneys belonging to the Company and placed in my hands for the purpose of making change.

I agree to make application for a bond with such Surety Association as the Company may designate, and in the event of its refusing to become my bondsman, that I will, upon notification to that effect, resign from the service and hereby agree to waive all claim for any damages resulting therefrom.

FRONT OF APPLICATION BLANK

which is attached to every article found, and gives "found by," "occupation," "where," "train or run number," "direction," "arriving at." The second is a card index of the articles, giving the same information as the tag, but having a space on which the owner can receipt for the article. Such articles, if not called for within six months, are returned to the finder, sold or destroyed. Receipts are also kept for six months.

Orders are filed by firms' names, and when the order is sent the duplicate is kept on file until the order is completed, when it is stamped "completed," and put in a permanent file. After the order has been completed the prices are entered up in another card catalogue, which is indexed by articles, and gives date, name and address, catalogue number, quantity, list price, discount, net.

SCHOOL FOR MOTORMEN AND CONDUCTORS

The company pays especial attention to the selection and instruction of its train crews, and has adopted a system of instruction and premiums which is quite unique. The company began operation May 20, 1903, and on the first anniversary of that event announced the following bonus system: "From and after this date, a semi-annual premium will be paid to regular conductors and motormen for each six months' clear record in their respective positions. To be eligible, a man must work on at least 150 separate days within the calendar six months, but in case leaves of absence be granted on account

I agree, as a punishment, in case of an infraction of the Company's rules, to serve time practicing or under suspension without pay

I agree to work under instruction on trial, without pay, at least ten days, and such additional time in excess thereof as the Company may deem necessary.

I understand that no compensation is paid to trainmen for time spent while engaged "on watch" (meaning waiting at any designated point for opportunity to work), but that wages are allowed only for service rendered while actually employed on the Company's cars, computed at following rates:

22 cents per hour for first year of continuous service, after being placed on extra list.

23 cents per hour for second year of continuous service, after being placed on extra list.

24 cents per hour for third and succeeding years of continuous service, after being placed on extra list.

These wages are satisfactory to me, and if employed, I agree to work contentedly and faithfully.

I further agree that if I am discharged or leave the Company's service voluntarily at any time during or after the trial period above referred to, I shall have no claim against the Company for service rendered, or expenses incurred by me during said trial period or while performing duty "on watch," as above explained.

I agree to provide myself at once with a standard uniform in accordance with the rules and regulations of the Company

While in the Company's service, I agree to study carefully and comply faithfully with all its rules, regulations and orders.

I, ..., have read the foregoing and clearly understand all conditions specified therein, and to the truth of all statements made, and my willingness to abide by the conditions of this contract, I hereby make affidavit.

State of Pennsylvania.
County of .... } ss:
City of ....

.... being duly sworn, deposes and says the above statement is true to the best of .... knowledge and belief.

Sworn to before me this .... day of .... 190...

.... NOTARY PUBLIC.

REFERENCES.

We, the undersigned, request the LACKAWANNA AND WYOMING VALLEY RAILROAD COMPANY to employ .... as ...., and do state that we are not related to him in any way, that we have known him intimately for the past (a) .... (b) .... (c) .... years, and that he is a man of good moral character, of sober, temperate and industrious habits, not addicted to the use of intoxicating liquors or drugs, and no violator of law and good order. And we further represent that he is a man of truth and integrity, good understanding, and of temper and manners fit to be employed on your railroad.

(a) .... Residence ....

(b) .... Residence ....

(c) .... Residence ....

LACKAWANNA AND WYOMING VALLEY RAILROAD COMPANY.

Application No. .... Badge No. ....

.... Employed as ....

Nationality .... Age .... Height .... Weight ....

Married, Single, Widower. General Appearance ....

Introduced by .... Approved by .... Surgeon .... 190 .

To Master Mechanic for instruction .... 190 ... Time with Master Mechanic .... hours

To Train Master for instruction .... 190 ... Time with Train Master .... hours.

Total time worked under instruction on trial .... hours.

Approved .... 190 ... . Master Mechanic

Approved .... 190 ... . Train Master

Appointed .... 190 ... . Superintendent.

CASH DEPOSIT.

This is to certify that there has been deposited with the Cashier the sum of $10.00 as a forfeit as provided in this application.

Date .... 190 . ... Cashier.

Received .... 190.., of the Lackawanna and Wyoming Valley Railroad Company, the sum of Ten Dollars ($10.00), being refund of above deposit.

SECOND PAGE OF APPLICATION BLANK

of sickness or other proper reason, the period of six months will be extended by the terms of such leaves of absence. In case an entry against a man's record be necessary, he commences a new period of six months immediately he returns to work after discipline. * * * * It is sincerely hoped that every conductor and motorman will merit this reward." The names are kept in a card index. Every time a man returns to work after discipline the date is entered in black, and every time that a man gets a bonus the date is entered in red.

In addition, the company conducts twice a year what might be termed a school for motormen and conductors. The course consists of six meetings, and every conductor and motorman is required to attend five of these meetings, whether

he is an old man or a new man. At the time this instruction is being given the schedules are re-arranged each week and the course repeated so that every train man has a chance to attend, and the men are paid while attending the school. Other employees, such as inspectors or switchmen, are welcome to attend the meetings, but attendance is not compulsory with them. Each session lasts an hour and a half. During the first half of each daily session, the chief despatcher discusses the subject of train rules, orders, etc., with the men. During the last half of each session the superintendent, Mr. Wilson, talks to the men on special operating features, hints on the care of new apparatus, methods of dealing with passengers, ejectments, accidents, and other subjects which the management thinks it advisable to discuss. What constitutes legal liability in accidents and ejectments is also explained so that the men may know how to avoid trouble and where to look for competent witnesses. The men are invited at these times to make suggestions, and many valuable points have been brought up by them. As indicating the value of these talks, the company had no accidents from November, the time of the last meeting, until well on into January.

The company employs exclusively for its train crews men who have had experience in steam railroad operation, and takes no one who has not had at least one year's service on a steam railroad, or its equivalent in the company's own service. It does not take employees from electric roads unless they have also had the steam railroad experience. The superintendent considers it essential that the men should instinctively get out the flag in the case of stops, as in steam railroad work. The company has fifty-five men in its train service, and has had very few resignations or discharges since the line went into operation. The front and back of the application blank, which is especially complete, is presented on page 171. Since the blank was printed the company has made a change in the wages paid, which are now 25 cents per hour for the first year of continuous service after being placed on the extra list, and 26 cents per hour for the second and succeeding years of continuous employment. In other respects the application blank is the same as that shown.

DEVELOPING FREIGHT TRAFFIC

In addition to the methods for developing passenger traffic already outlined, the company has engaged quite extensively in advertising to manufacturers the advantages of locating their works along its line. In particular it has issued a twenty-page folder for this purpose, in which the cheap fuel and power facilities of the territory between Scranton and Wilkesbarre is described in detail. The company states that it has recently installed at Scranton a large power plant whose capacity is in excess of that required for the road, and which has been designed to supply power for industrial purposes. In addition the company's freight facilities are excellent, and it is prepared to make such connections in the way of sidings as will appeal to manufacturers. A map is published in which the industrial locations available along the line of route are indicated. Passenger traffic circulars are coming to be very common among electric railway companies, but a vigorous campaign to secure new manufacturing plants along their lines is as yet rare among electric railway companies.

OFFICERS

The officers of the company are: President, George C. Smith, of Pittsburg; vice-president and secretary, Charles F. Conn, of Scranton; treasurer, Carl M. Vail, of New York; auditor, H. E. Yost; traffic manager, B. F. Wyly, Jr.; superintendent and purchasing agent, Chester P. Wilson.

CONVENIENT METHOD OF THROWING SWITCHES

Much of the trouble usually attendant upon the throwing of a switch by the motormen is avoided by the Clinton Electric Railway Company, Clinton, Ia., by the method illustrated in the accompanying illustration. A hole is cut in the platform over the rail, and the switch-iron is extended through this. With a little experience the motorman is enabled to

METHOD OF THROWING SWITCHES AT CLINTON, IA.

stop the car in such a position that the hole is immediately over the switch tongue, and then it is a very easy matter to throw the switch. R. M. Howard, general manager of the system, states that the method is satisfactory in every way. The cars on the Clinton system are mounted on a single track, but this method of throwing switches is used in Minneapolis and St. Paul on double-truck cars.

The Lake Shore & Michigan Southern Railway is constructing in its freight yards at Collinwood an electric line for the purpose of carrying switchmen and other employees to and from different points in the yards. The Collinwood yard is the largest on the system, and all freight trains are made up here. For a long time the company used a switch engine for carrying the men back and forth. Later a gasoline car was used for this purpose, but it did not prove altogether satisfactory, and the company is stringing trolley wire over one of its tracks in the yard and will operate an electric car up and down these tracks at frequent intervals. Arrangements have been made with the Cleveland Electric Railway Company to secure the necessary power.

SOME OPERATING FEATURES OF THE TOLEDO & INDIANA

The Toledo & Indiana Railway, operating from Toledo to Bryan, Ohio, was completed about a year ago, and the equipment and power station were fully described in the Street Railway Journal of Oct. 21, 1905. Since that time the road has changed hands, and is now being operated by E. E. Darrow, managing engineer, who has instituted a number of innovations in operating practice and in new equipment which are quite interesting.

COST OF CAR-LOAD FREIGHT

As outlined in the previous article, the road does quite an extensive car-load freight business. There has long been a great difference of opinion among traction-line operators as to the profit aspect of this class of business, and even among those roads which are engaged in it there has been a woeful lack of data as to the cost of operating freight trains and the effect such traffic has upon the general welfare of the road.

Before going into the subject it would be well to recapitulate some of the general conditions which this road encounters. It extends from Toledo to Bryan, 56 miles, closely paralleling the main line of the Lake Shore & Michigan Southern Railroad. Except in passing through towns the rights of way of the two roads adjoin one another, and in view of the remarkable freight-handling facilities of this great steam road, it would seem at first glance to be the height of folly to attempt to compete with it on bulk car-load freight. It appears, however, that the steam road has more business than it can handle. This particular district is a very prosperous one, originating more than the average amount of freight, and the steam road seems to be perfectly willing that the electric shall handle a few cars a day between local points. Local people shipping to nearby points are glad to give the business to the electric line, because they are sure of prompt delivery. The electric line has its own cars and is glad to accept broken lots, and usually it is possible to get better car service from the electric than from the steam. The line now has an arrangement with the Toledo Terminal & Belt Line whereby freight cars run to its terminal station in the heart of Toledo for loading and unloading. The belt makes a charge of $3 per car for handling to any point on its line or to the terminal station. The traction line has about twenty standard box cars which are marked as private cars so that they will not be taken off from the Belt Line. Shipments to distant points are frequently made in foreign cars delivered by the Belt Line, the traction company receiving a switching charge for handling them.

ELECTRIC LOCOMOTIVE HAULING STEAM ROAD FREIGHT CARS

The road is remarkably level, there being no grades over 2 per cent, and there are no sharp curves. In fact, it is possible to run a train of standard freight cars from one end of the line to the other. Freight trains are handled by a locomotive built at the company's own shops. The floor framing is weighted with rails, and the weight of the locomotive is 82,000 lbs. It is equipped with four Westinghouse No. 112, 75-hp motors with a gear ratio of 64 to 18. The maximum speed is about 20 m. p. h., and the scheduled speed is 15 m. p. h. It is fitted with a Westinghouse L-4 controller, and has air brakes and Van Dorn couplers. It has handled twelve loaded freight cars.

Tests made by the managing engineer have demonstrated that the locomotive alone consumes 4 kw-h per car mile. He states that each loaded car adds 2 kw-h to the power consumption, and that this increase holds good with each car added up to ten cars, which was as high as he went. The readings were taken on the locomotive over a run of 50 miles. Current from the company's station delivered at the cars costs about 1 cent per kilowatt hour. The cost of the current for the locomotive is therefore about 4 cents per car mile, and each car added increases it to 2 cents per car mile. The locomotive covers a round trip daily of about 100 miles. The daily cost of operating the locomotive alone is figured at $4 per day for power, $1 for repairs, lubrication and incidentals, and $4 per day for train service, or a total of $9 per day, the cost of operating the locomotive alone. As intimated, the cost of each car is about $2 per day. Over a period of six months the average number of cars handled daily has been five each way, or 500 car miles per day. The actual earnings from freight have been 15 cents per car mile, or $75 per day for the crew. It will be seen, therefore, that according to these figures there is a very nice profit in this business. This method of calculation, of course, makes no charge for the freight operation, for the expenses of track and overhead maintenance, and the maintenance of station agents, and numerous other expenses incident to the operation of the road. Mr. Darrow probably figures that these would be necessary anyway, and that this freight is merely a small adjunct which yields a good return from the extra investment.

The load on this line includes five passenger coaches, on hourly schedule, two limited trains making three round trips each, three express cars making two round trips each, and the freight train, making one round trip.

All of this load, including a small lighting load which will be referred to later, is handled by one 600-kw generator. The load factor averages pretty close to the normal rating, and the station output averages 10,000 to 12,000 kw hours per day. The managing engineer claims that it is impossible to note any great difference in the current consumption, whether the freight train is on or off, the output on Sundays being usually only a trifle less than on week days. He says that the freight train in starting does not produce any more of a peak than the limited cars, which are geared high and start fast. He believes that he has practically ideal conditions for small freight business of this character. He does not believe that these favorable conditions would hold true if there was business enough to warrant the operation of several freight trains, because then the fluctuations would be much greater than at

present, and it would be necessary to install additional machinery and feeders, and the profit from the freight alone probably would not be sufficient to warrant the large outlay. The lack of grades and curves, of course, renders this additional load much easier on the power station. Additional freight trains would also interfere with the passenger service, which is very fast. With but one train of this character, the freight clears the limited cars by five minutes and has never delayed them.

FAST LIMITED SERVICE

The limited service on this line is claimed to be the fastest in Ohio, the cars covering the 56 miles in 1 min. 45 sec. This is practically the same as the steam trains which make the same

A TOLEDO & INDIANA PARLOR CAR

stops, and people are enabled to reach the business centers of the town in faster time than on steam trains. Two very fine parlor cars, the "Virginia" and the "Madlyn," are used in this service. They were fitted up in the company's own shop and are handsomely finished and furnished. Three different styles of wicker chairs are used. The corner seats are couches large enough for two, while some of the chairs have high rolled backs, while others are smaller and the seats are lower, the idea being to provide comfortable seats for men or women. The cars seat thirty-two passengers, twelve in the smoking compartment The window draperies are dark green, and the floors are carpeted with a heavy carpet of the same color. The smoking room has linoleum covering. In one corner of the main passenger compartment is a neat little writing desk. The stationery is provided, and a number of current magazines are also supplied. The lighting of these cars is very liberal, there being side lights and electroliers, the lamps on the latter being fitted with white globes. An excess fare of 10 cents is charged on these cars, and baggage is carried free. It is stated that this small excess is not objectionable, and that the limited cars earn about the same per car mile as the local cars.

CASH RECEIPTS

The company has recently adopted the scheme of charging 5 cents more for fares paid on cars than for the ticket fares, and making the cash fare receipt redeemable for 5 cents at any ticket office. This has the effect of discouraging the payment of fares on cars, and at the same time does not cause the discontent among people who do not have ready access to ticket offices as the scheme of making a straight increase for fares paid on cars. The fares on the Toledo & Indiana are a trifle higher than on the parallel steam road, due to the two-cent fare law recently passed in Ohio, but the frequent service, the high speed and superior accommodations of the limited have enabled the traction company to hold its own; in fact, the business has improved, because the steam road has reduced the number of its local trains.

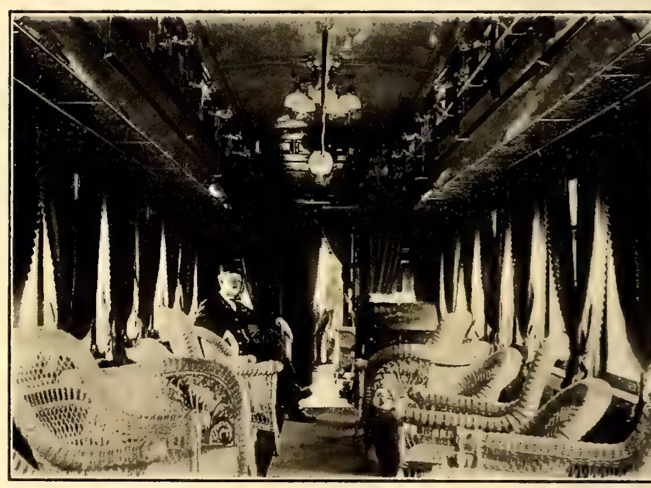
FLOATING SUB-STATIONS

Mr. Darrow was formerly an advocate of floating sub-stations, and the Toledo & Indiana was built with all but one of its sub-station outfits in cars. Mr. Darrow believes it is impossible properly to protect such outfits from lightning. Lightning recently got into one of these cars and went through the oil switches and transformers, throwing the oil all over the car and entirely destroying everything in the vicinity. A new sub-station being erected to take the place of this will contain no wood of any kind, the walls, roof and floors being of concrete, and unusual precautions will be taken to guard against lightning.

SPRING SWITCHES

Originally the road was laid out with spring switches at all turnouts. Recently an entire freight train was derailed on one of these switches, and investigation showed that a piece of coal had dropped into the switch and held it open just far enough to cause the derailment. Figuring on what might have occurred if one of their limiteds had struck this point, the management took out all the spring switches. It takes a little longer to open and lock a switch, but it is figured that it is better to make up this time in some other way.

Unlike many others, this management does not countenance the running at high speed through villages and towns. It has gained the good will of all the towns along its line by urging them to pass speed ordinances limiting the speed to 12 miles an hour, and employees have been instructed that they must obey these ordinances. Between towns the road



THE RICH INTERIOR OF A TOLEDO & INDIANA CHAIR CAR

is a perfect tangent on which the men can run as fast as they want to.

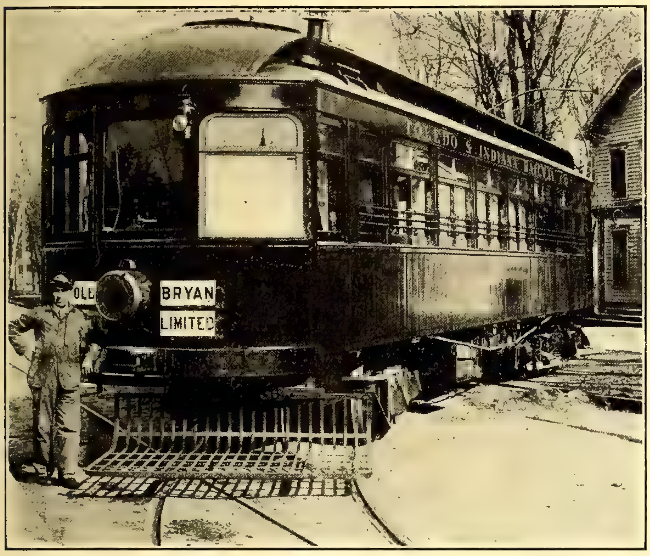
STEEL VS. CHILLED WHEELS

While the majority of high-speed operators are advocating steel-tired wheels, Mr. Darrow, after using them for two years, has returned to the advocacy of chilled wheels. His complaint against steel wheels is that they do not wear even, one wheel wearing sharp and another one round. He believes that it is necessary to keep all the wheels on the set the same diameter, or the smaller wheels will have a tendency to slip, causing a drag on the car and an uneven wear to the wheels, so that they have to come in frequently to be turned. His argument is that steel wheels cost about $30 net, including the rebate for old material, while the cast-iron wheels cost about $4 each, including the rebate. The Griffin wheel which he has been using averages about 60,000 miles, so that

he can get over 300,000 miles for the cost of the steel-tired wheels, and he has been unable to find a steel-tired wheel that will give such a mileage. The straight track and lack of curves and excellent city entrance is undoubtedly accountable for the excellent service given by the cast-iron wheels.

SWINGING FENDER

Several cars on this line have recently been equipped with a new fender made by J. A. Sage, of Bryan, Ohio The fender



HEAD-ON VIEW OF CAR, SHOWING FENDER CONFORMING TO CURVATURE OF TRACK

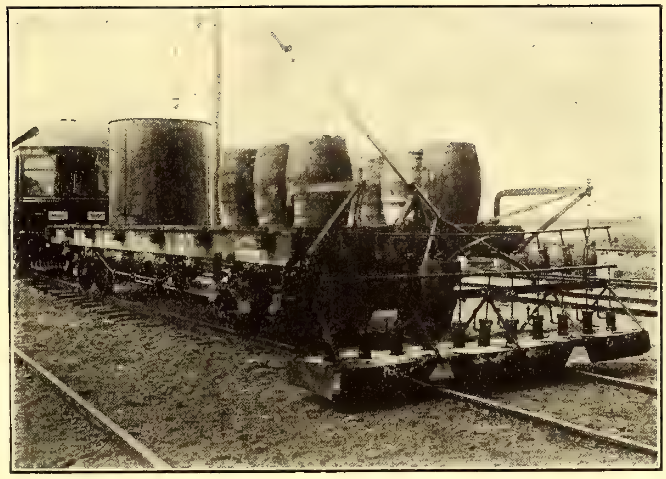
is of the ordinary Detroit "gridiron" pattern, and possesses the interesting feature of following a curve. A metal track is attached to the body of the car and the fender is attached rigidly to a carrier hung on this track with anti-friction rollers; the carrier, which is simply a forked lever, is pivoted at the back end of the car, and a lever attachment to the truck causes the fender to swing with the trucks. The device is designed so that it can be used with the type of fender which drops, as well as with the stationary type of fender. The illustration shows the fender swinging with a curve. The motorman is standing in a position where he would be struck by an ordinary fender.

BURNING WEEDS

The line traverses a sandy district, and the removal of weeds from the right of way has been an expensive and troublesome proposition. Recently an interesting outfit was rigged up for burning weeks. A number of tanks of crude oil are mounted on an ordinary flat car and the oil is conveyed through nozzles under an air pressure of 80 lbs., which makes a very hot flame. The burners are surrounded by sheeting to keep the sprays in the proper place, and the sheeting, becoming red hot, aids in the burning and drying out of the weeds in the track. A large tank of water with hose connections is carried on the car to prevent any spread of fire. The burning outfit may be raised or lowered by a lever as the conditions may develop. In practice it has been found that it takes one barrel of crude or torch oil per mile. About three miles per hour can be covered easily, so that it makes a simple and effective way of fighting weeds, and the expense is very slight as compared with the old way of digging them out.

LIGHTING

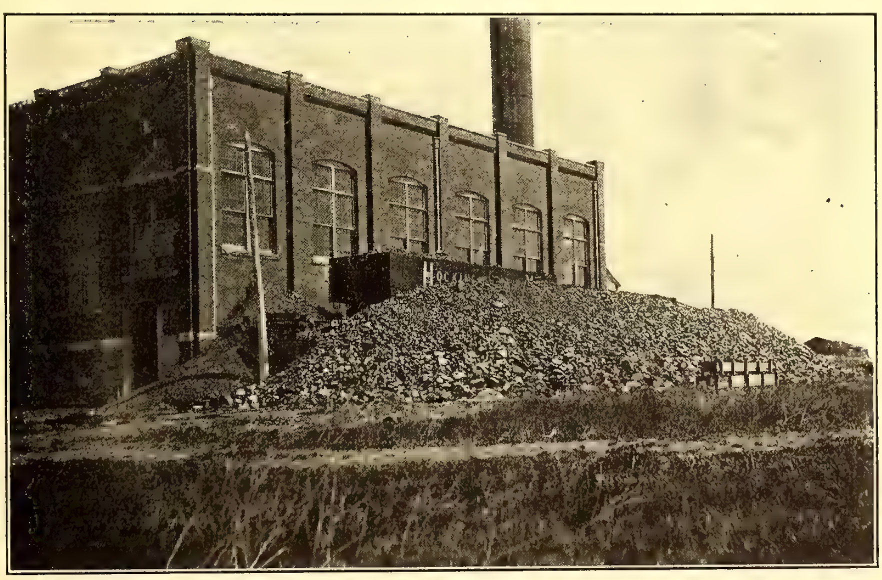
The company is negotiating to illuminate the village of Stryker. At present there are installed 26 arc lamps and about 1000 incandescent lamps operated from a city plant, which is unsatisfactory. The plan is to supply the current at the flat rate of 4 cents per kilowatt hour on the high-tension side of a step-down transformer, the village to maintain the system as heretofore. The contract provides that the village lighting shall be a secondary consideration to the operation of the interurban line.



THE WEED BURNER LOWERED

EMPLOYEES' CLUB

The Toledo & Indiana employees' club has recently been formed by employees, all employees and officials being members. A well-equipped clubroom, with reading room, billiard table and bathroom, has been fitted up at the headquarters at Stryker. The membership provides for dues of 50 cents per month, and a fund has been created from which employees receive a benefit of $6 per week during sickness.



COAL SUPPLY AT POWER HOUSE

ADVERTISING

One of the most profitable methods of advertising for an electric road is the publishing of time tables in the daily papers of the towns through which the line passes. Of course the more information presented in this way the better it is, but frequently operators figure that the less space used the better, and they are satisfied with a bald statement that

trains in certain directions leave at a certain time. The Toledo & Indiana publishes its complete time table in all the towns along its line. One form of copy does for all the towns. As will be noticed from the accompanying reprint, the names of the stations appear at the top of the column, together with the miles from Toledo and the rates of fares from Toledo. Then follow the trains west bound and the trains east bound. Reading across the column, the seeker for information can ascertain the times of any train at any station. The entire advertisement occupies five inches single column, and gives all the information that can be desired in a concise and legible manner.

TOLEDO & INDIANA RY. CO

TIME TABLE

WEST BOUND

Toledo....	Swanton ..	Delta......	Wauseon	Pettisville.	Archbold..	Stryker....	Bryan. ...
Miles	20	26	34	38	42	48	56
Fare	$ 0 40	$ 0 55	$ 0 70	$ 0 80	$ 0 90	$ 1 00	$ 1 15
......	......	6 20	6 36	6 48	6 55	7 08	7 25
* 6 05	6 54	7 06	7 17	7 26	7 33	7 42	7 55
7 00	8 08	8 22	8 38	8 48	8 55	9 08	9 25
* 8 05	8 54	9 06	9 17	9 26	9 33	9 42	9 55
9 00	10 08	10 22	10 38	10 48	10 55	11 08	11 25
*10 05	10 54	11 06	11 17	11 26	11 33	11 42	11 55
11 00	12 08	12 22	12 38	12 48	12 55	1 08	1 25
*12 05	12 54	1 06	1 17	1 26	1 33	1 42	1 55
1 00	2 08	2 22	2 38	2 48	2 55	3 08	3 25
* 2 05	2 54	3 06	3 17	3 26	3 33	3 42	3 55
3 00	4 08	4 22	4 38	4 48	4 55	5 08	5 25
* 4 05	4 54	5 06	5 17	5 26	5 33	5 42	5 55
5 00	6 08	6 22	6 38	6 48	6 55	7 08	7 25
* 6 05	6 54	7 06	7 17	7 26	7 33	7 42	7 55
7 00	8 08	8 22	8 38	8 48	8 55	9 08	9 25
* 8 05	8 54	9 06	9 17	9 26	9 33	9 42	9 55
9 00	10 08	10 22	10 38	10 48	10 55	11 08	11 25
*10 05	10 54	11 06	11 17	11 26	11 33	11 42	11 55
11 00	12 00	12 10	12 22	12 30	12 37	12 46	1 00
EAST BOUND							
7 00	6 00	5 46	5 33	5 22	5 14	5 02	......
....	......	6 20	6 02	5 53	5 43	5 32	....
7 55	7 06	6 54	6 43	6 34	6 27	6 18	* 6 05
9 00	7 52	7 38	7 22	7 12	7 65	6 52	6 35
9 55	9 06	8 54	8 43	8 34	8 27	8 18	* 8 05
11 00	9 52	9 33	9 22	9 12	9 05	8 52	8 35
11 55	11 06	10 54	10 43	10 34	10 27	10 18	*10 05
1 00	11 52	11 38	11 22	11 12	11 05	10 52	10 35
1 55	1 06	12 54	12 34	12 34	12 27	12 18	*12 05
3 00	1 52	1 38	1 22	1 12	1 05	12 52	12 35
3 55	3 06	2 54	2 44	2 34	2 27	2 18	*2 05
5 00	3 52	3 38	3 23	3 12	3 05	2 52	2 35
5 55	5 06	4 54	4 43	4 34	4 27	4 18	* 4 05
7 00	5 52	5 38	5 28	5 12	5 55	4 52	4 35
7 55	7 06	6 54	6 43	6 34	7 27	6 18	* 6 05
9 00	7 52	7 38	7 23	7 12	7 05	6 52	6 35
9 55	9 06	8 54	8 43	8 34	8 27	8 18	* 8 05
11 00	9 52	9 38	9 28	9 12	9 05	8 52	8 35

*Limited Trains—stop only at ticket offices.

TOLEDO & INDIANA RAILWAY COMPANY TIME TABLE

EXTENSION TO FORT WAYNE

The owners of the Toledo & Indiana Railway have secured right of way for an extension of 41 miles from Bryan to Ft. Wayne. Arrangements have been completed for financing this section. The new extension will cost in the neighborhood of $600,000, and will reduce the cost of the entire property to the rate of $20,000 a mile, as the power station was designed to handle the entire road from Toledo to Ft. Wayne. This will be a very direct route between these two large centers, continuing the present limited schedule, and also furnishing the most direct route from Toledo to Indianapolis.

TRACK CONSTRUCTION IN MONTREAL

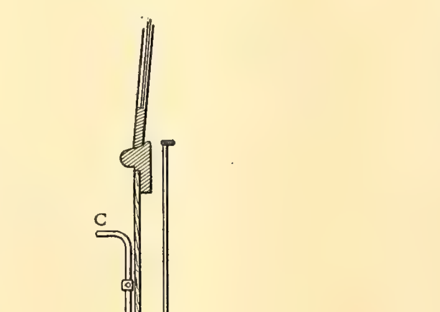
In a paper read at the last meeting of the Canadian Street Railway Association, M. Nielson, consulting engineer of the Montreal Street Railway Company, described his ideal of track construction in paved streets. He recommended a T-rail, A. S. C. E. standard, weighing 90 lbs. per yard and in 60-ft. lengths. It should have sufficient depth to allow the laying of 6-in. scoriae grooved blocks inside the rail. In macadam streets he recommended 80-lb. T-rail in 60-ft. lengths. The joints should be made with heavy 28-in., six-bolt angle plates, or with "continuous" joint plates.

For the foundation Mr. Nielson recommended concrete stringers 2 ft. wide and 12 ins. deep under each rail. In laying the track the rails are mounted over the trenches for the concrete on ties spaced 12 ft. apart. These ties are merely to bring the rails to a correct surface. Tie-rods are used every 5 ft. or 6 ft. After the track is surfaced the concrete is tamped in under the rails and laid between the rails to a depth of about 6 ins. to support the stringers. Care should be taken to prepare the foundation for the concrete so that the section will be as near as possible uniform the whole length of the track. Great care should also be taken with the earth foundation upon which the concrete is to rest. It should be well rammed or rolled to an even hardness. These details are very important.

When relaying track in streets which were concreted when the track was first laid, stretches of good solid concrete can often be utilized. All the old concrete in the bad stretches should be removed and new work of the kind described put in. Where the concrete is good quality, although broken into large slabs which rest upon a well-settled earth bed, it seems unwise to disturb it. In cases like this the practice in Montreal is to lay the rails on top of this work, held together with tie-rods only. The rods are placed every 6 ft. The rails are shimmed to correct grade, everything loose on top of the old concrete is removed, and the whole surface is kept well moistened ahead of the new layer of concrete, which varies in thickness according to the settlement that has taken place under the original mass. In cases where no settlement has taken place and there is not sufficient depth to allow the new concrete being tamped under the rail, pure cement mortar is run under. Work like this, properly done, should stand up well, and it is self-evident that it is the cheapest way of preparing the foundation for the new rails. In every case where entirely new concrete work is put in, no cars should be allowed on the rails for at least ten days after the last batch of concrete is laid; good work is sometimes ruined by allowing traffic on it too soon.

A CONVENIENT HEADLIGHT TRIP

The majority of the arc headlights in use at the present time are probably those of the automatic type or the type that is self-tripping. There are, however, many of the older style in use that necessitate pushing a button in order to cause an arc to be drawn after the lamp has been extinguished. On a road where such lamps were in use to avoid the inconvenience of letting the window down whenever it was necessary to trip the lamp, a device shown by the accompanying drawing was devised by the master mechanic.



DETAILS OF HEADLIGHT TRIP

In the drawing, *B* is a pin projecting up through the floor of the motorman's cab. Its lower end is attached to about the middle point of a lever which has its fixed point at *A*. At the outer end is a long rod which projects up through a bumper block and terminates in a flattened-out angle at *C*, which is immediately over the button of the headlight. Pressing the pin *B* causes the angle *C* to push the button of the headlight down until the carbons make contact. When the foot is removed a spring under *B* restores *C* to its normal position. This device was put on thirty cars at a cost of about one dollar per car. In this instance a hole was bored through the floor and bumper block.

COMBINED COMFORT AND WAITING STATIONS IN CLEVELAND

The city of Cleveland is preparing to make some liberal expenditures in the erection of shelter houses and public comfort stations in various parts of the city, particularly at transfer points on car lines, where they will serve as waiting rooms for transferring passengers. Several elaborate stations have been erected in the public parks, while in the public square, the most congested point in the city, where an immense amount of transferring of passengers is done, there are three of these stations. Two of them are simple shelter houses built of structural iron with wide tile roof, and a section which is closed and heated in cold weather, while the third building combines the features of a public comfort station and a waiting room for the interurban passengers. The two smaller buildings are on the north and south and east and west streets through the center of the public square, while the comfort station is on the southwest corner of the square, which section is given over entirely to the interurban cars. There are double tracks around this corner, and all the interurban cars stop at this point several minutes before the hour of departure, so that the building, while owned and maintained by the city, answers all the purposes of an interurban station. The traction companies maintain a ticket office, checking station and small waiting room immediately opposite the station, so that the arrangement is a great improvement over the plan formerly in vogue of obliging passengers to wait for cars in the open.

The public comfort station, while built by the city, was originally proposed by the traction companies, and the story of how it was secured is somewhat amusing, as showing the inconsistencies of city governments. The interurban companies offered to erect the station, deed it to the city and maintain it at their own expense, the only condition being that the companies be permitted to reserve a small corner for a ticket seller. In addition the companies even agreed to check baggage free of charge. An ordinance was passed and plans prepared, when there came a hitch as to who was to furnish the towels to be used by the general public. The city insisted that individual towels be furnished to every one who took advantage of the convenience. The companies objected to this on the ground that it would be rather expensive. Then some one secured an injunction on the ground that the park property could not be used for private purposes. The matter dragged for about a year, and finally the city erected the building itself, utilizing the plans prepared by the traction companies. As it stands, the interurbans are getting practically all they wanted at no expense whatever, as the city even maintains attendants who direct passengers to the proper cars.

SHELTER HOUSE ON PUBLIC SQUARE FOR CITY PASSENGERS

PUBLIC COMFORT STATION AND INTERURBAN WAITING ROOM

The building is of artistic architectural effect, built of dark pressed brick and stone trimmings. The frame is of steel and the roof of red tile. Above ground the building is 70 ft. long by 16 ft. wide, and contains a large open space divided in the center by a railing separating the quarters for men and women. The space is filled with comfortable wooden benches, giving quite a large seating capacity. The space is closed in winter, while in summer the doors are removed, making practically an open side facing the tracks. The building is well heated in winter and a boiler fired by natural gas and supplying a number of steam radiators around the walls. The basement of the building extends beneath the sidewalks, giving a space 30 ft. x 70 ft. Toilet accommodations are provided for both men and women. The rooms are accessible by stone steps at either end of the building. The basements are finished in white glazed brick, and the plumbing, fixtures and facilities are equal to those found in the best hotels, there being attendants constantly on duty in both rooms. Hot and cold water and individual towels are among the conveniences. The cost of the structure was about $12,000. The institution is of tremendous convenience to interurban passengers as well as to the general public.

THE RECONSTRUCTION OF THE CLINTON STREET RAILWAY SYSTEM, CLINTON, IOWA

About one year ago the system of the Clinton Street Railway Company, then known as the State Electric Company, was completely rebuilt. The old track was torn out and relaid with heavier rails, new overhead work was put up, new cars were obtained, and a building containing shop, storage houses and offices erected. In fact, the old system might be said to have been replaced by a new one. As it stands now it is an ideal one for a small city. The reconstruction was carried out in such a thorough manner that it would be difficult to find where any extensive improvements or changes could be made to any advantage.

The system comprises about 16 miles of single track. The greater portion of this lies on Second Street and connects Clinton proper with Lyons, which was formerly a separately incorporated town, but is now a part of Clinton. The two towns have a combined population of about 25,000. A spur from the end of Second Street, or main line, continues to Eagle Point Park, operated by the railway company, on the bluffs overlooking the Mississippi River and about four miles above Clinton. A crosstown line on Sixth Avenue serves the Western portion of Clinton, and is also used for an

TAMPING UNDER THE TIES

entrance for the interurban line of the Iowa and Illinois Railway Company, operating between Clinton and Davenport. Power for the line is purchased from the Clinton Gas Company, which has installed a 350-kw Bullock generator to care for the railway load.

Several reasons combined to bring about a decision to reconstruct the line. With the exception of the track construction the new work was done by the railway company under the supervision of R. M. Howard, general manager of the system. The tracks were rebuilt by the North American Railway Construction Company, of Chicago. They are comparatively heavy, considering the weight of the cars operated on them. The main line on Second Street is built with 72-lb. 6-in. T rails, while the Sixth Avenue line is of heavier construction, because the heavy interurban cars of the Iowa & Illinois Railway Company are operated over it. On this line 80-lb. 7-in. T rails were employed. At intervals of 10 ft. the rails are tied together with 1⅜-in. x ⅜-in. rods. In all of the work No. 1 white oak ties measuring 6 ins. x 8 ins. square and 8 ft. long were employed, and were placed with centers 2 ft. apart.

After the old track had been torn out the ground was ex-

LAYING THE PAVEMENT

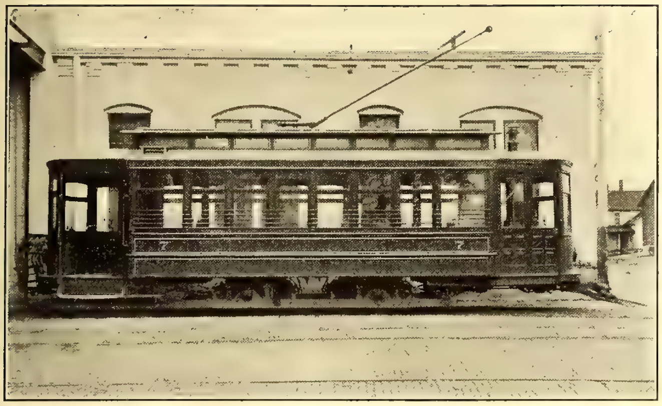
cavated to a depth of about 8 ins., and the bottom of the excavation was filled with 4 ins. of crushed rock obtained from a local quarry. The rock was well rolled with a 13-ton steam roller before the ties were laid upon it. These were afterward raised about 2 ins. by tamping, giving 6 ins. of

TRACK PARTLY LAID

rock under them. Under special work and under about 2000 ft. of track on Sixth Avenue over what was formerly low, swampy land, the ties were laid on a 6-in. concrete bed. The special work used was of the Lorain Steel Company special built-up construction. In the lower illustration on page 178 is shown a piece of special work employed at Sixth Avenue and Second Street. This, as may be seen, is a three-way switch. The rails are all in 60-ft. lengths, and are connected by continuous rail joints, and two 4-0 protected rail bonds are employed at each joint. In installing these bonds the holes are drilled 1-16 in. small at the mill, and were reamed out dry

with a portable reamer just before the bonds were placed in position. In order to interfere with traffic as little as possible during construction work, only 1000 ft. of track was torn up at one time, and cars were operated up to both ends of the torn-up section and the passengers were transferred around the work in buses hired by the company.

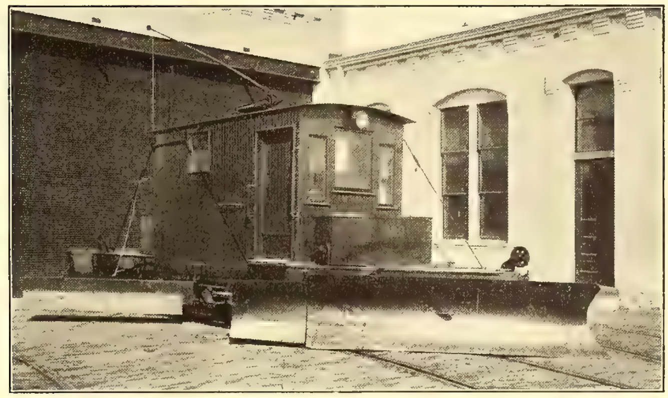
White cedar poles with 7-in. tops and 30 ft. in length were employed in constructing the overhead. To give the poles a better appearance they were painted a slate color to a height of 5 ft. above the ground. The overhead construction of the main line and the Sixth Avenue line differ in that on the main line the trolley is of 2-0 wire and no feeders are employed, while on the Sixth Avenue line a 4-0 trolley and a 4-0 feeder are used. The greater portion of the main line is double track, and the two trolleys are continued over the single track to the ends of the line. Over the entire line Garton lightning arresters are placed on poles at 1000-ft. intervals.



STANDARD 20-FT. SEMI-CONVERTIBLE CAR

CAR EQUIPMENT

When the line was reconstructed enough cars were purchased to operate it without the use of the old ones. The new equipment consists of six semi-convertible cars with 20-ft. 8-in. bodies built by the St. Louis Car Company, six ten-bench open cars and two Brill semi-convertible cars of the American Car Company manufacture with 20-ft. bodies. In addition there are six old summer cars used when travel is heavy. All of the cars are equipped for operation from either end and are provided with Providence fenders, International double fare registers, automatic circuit breakers, and electrical meters. The semi-convertible cars are provided with cane cross seats of the walkover type, and are heated with hot-water heaters carried in the vestibule. The cars built by the American Car Company are mounted on No. 21-E trucks, while the remainder are equipped with St. Louis No. 35 trucks. All are equipped with two GE 67 motors and K-10 controllers. Trucks and electrical equipment are provided for all of the cars, so that no changing over is necessary in the spring and in the fall. This practice is followed because all the cars, both open and semi-convertible, are required to care for summer travel. The cars are all painted a chrome green. No lettering is used, but the sides are striped in gold. In addition to passenger cars the equipment of the system includes a line car, a salt car and a snow plow. This latter was built in the shops of the company. It is mounted on a single track upon which are mounted two GE 67 motors. The plows, one on each end, serve to counterbalance one another, one being raised while the other is lowered, a winch inside the car operating them. Boxes on each end of the car are loaded with 2½ tons of scrap iron. The line car was constructed from an old closed car. The tower is supported by five 4-in. pipes, and is raised by a winch inside the car. A salt car built from an old closed car body has inside of it a grinder driven from the axle, for grinding the rock salt used on the track. This car is not provided with motors, but is usually pulled by the line car.



SNOW-PLOW BUILT IN THE COMPANY'S SHOPS

A THREE-WAY SWITCH AND OTHER SPECIAL WORK AT SIXTH AVENUE AND SECOND STREET

THE NEW SHOPS

The old shops and storage barns were located on Sixth Avenue in the down-town district of the city. The location of the new shops at Sixth Avenue and Randolph Streets is about midway between Clinton and Lyons, and was decided upon partly because it was a convenient point, but the fact that it was outside the fire district and cheaper insurance could be obtained was of considerable influence. The executive offices and storage barns are built in conjunction with the shop.

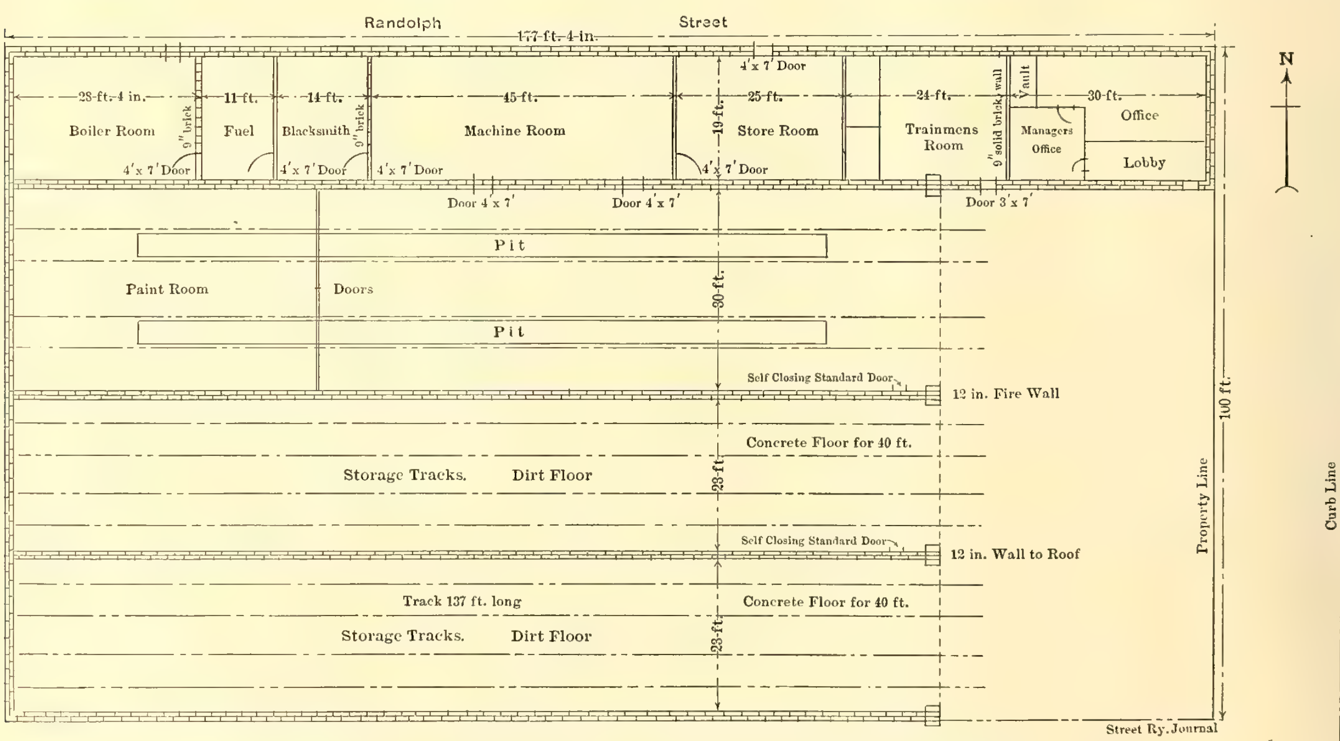
The general design of the building was worked out by Mr. Howard to meet the conditions arising on this particular road. They have been found satisfactory in every particular, and their adaptability to such a road may be judged by the

fact that the design has been copied in one or two instances for other roads. The building measures 100 ft. by 177 ft. 4 ins. long. It might be said to consist of four sections, two on the south for the storage of cars, a car shop proper immediately north of these, and a section somewhat longer than the car shops which contains the machine shop, boiler room

GENERAL VIEW OF SHOPS AND OFFICES

for heating the building, the forge room, store room, trainmen's waiting room, and offices. The building is of sand lime brick, and while no attempt has been made to construct an ornate building, the structure, as may be observed by the illustration, is of pleasing appearance. Wood truss construction is employed to support the tar and gravel roof, and these wooden trusses have been so built that in case of fire they will be burned away without injury to the walls. In car-shop construction very frequently sufficient attention is not given to the arrangements for proper lighting. Mr. Howard, however, appreciates the importance of light in such a shop, and the roof is liberally supplied with skylights, as may be observed from an accompanying view. With the exception of the roof trusses, there is practically no wood used in the construction of the car shop and storage barns. The floors and pits are of concrete, and the front doors are of the Kinnear rolling steel type. The brick wall separating the car shop and the adjacent storage compartment, as well as that between the two storage compartments, extends above the roof, and the one opening in each of them is provided with a self-closing fire-proof door. In fact, every precaution has been taken against fire that could be gotten with a reasonable outlay of money.

The car shop proper is provided with two tracks, both of which have concrete pits. The rear portion of this shop is arranged to be used as a paint room during that season when the cars are being overhauled, and at other times to be utilized for general repairs. It is separated from the forward portion of the shop by hinged doors which close it up tight so that the proper temperature can be maintained in it irrespective of the temperature in the forward portion. Separate hinged doors for closing the pits are provided under the main doors. The shop is provided with overhead carriers and other means for handling wheels, armatures and other heavy parts. An illustration on page 180 shows the method of raising car bodies free from the tracks when these are to be repaired or wheels are to be changed. Four chain hoists are suspended to I-beams overhead, and by means of a T-rail placed under the car at each end and supported by a pair of the chain hoists the car body is quickly raised to any desired height. Another illustration shows an overhead traveler supported from an I-beam above the trolley. In the illustration may also be seen the trolley bridge, which when let down permits the traveler to pass beyond the trolley. A jumper passing over the I-beam connects the two sections of the trolley so that the section beyond the break is never dead, with the consequence that an arc can never be drawn



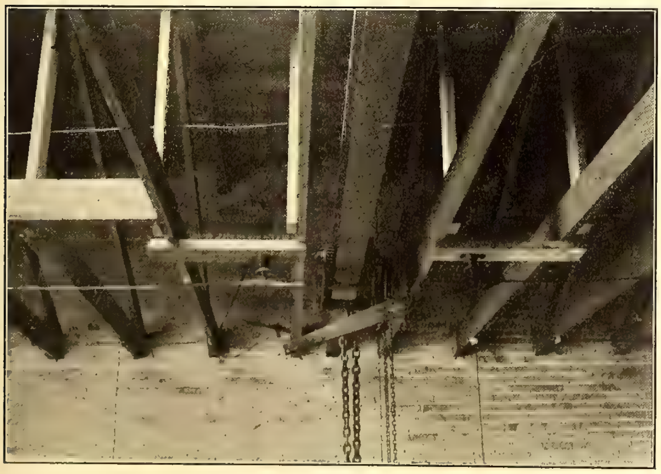
PLAN OF SHOPS AND CAR HOUSE OF THE CLINTON STREET RAILWAY COMPANY

by letting the bridge down, when current is being taken from the section of the trolley beyond it. The bridge, which is made of a piece of heavy sheet iron bent into a U shape, is hinged at one end and is raised or lowered by a cord which passes over pulleys, and drops to a point along the wall within easy reach of the floor.

The shop is heated by hot air supplied by means of a motor-driven blower which forces the air over steam coils supplied with steam from a boiler. The air pipes are laid down underneath the concrete floor, and the outlets are in the sides of the pits near the bottom. This method of heating was followed not so much to keep the pits comfortably warm for the workmen as to dry out the motors and electrical apparatus under the car. It is the custom to allow the cars to remain over the pit and be subjected to the drying process as many hours as the schedule and repairs on other cars will permit. Since this practice has been followed there has been quite a decrease in cable troubles and breakdowns due to dampness of the apparatus.

That portion of the building used for the storage of cars was erected in two sections with a 12-in. wall separating them, because it was found that there was very little difference in the cost of this construction and steel girder roof construction extending clear across the four tracks. Separating the storage space in two sections, moreover, permitted the summer equipment to be stored away and closed up until spring. Storage space has been provided for all of the equipment of the road, first, because it was considered better economy to provide shelter for the cars, and secondly, because the cars can be maintained in a much better manner when kept out of the weather

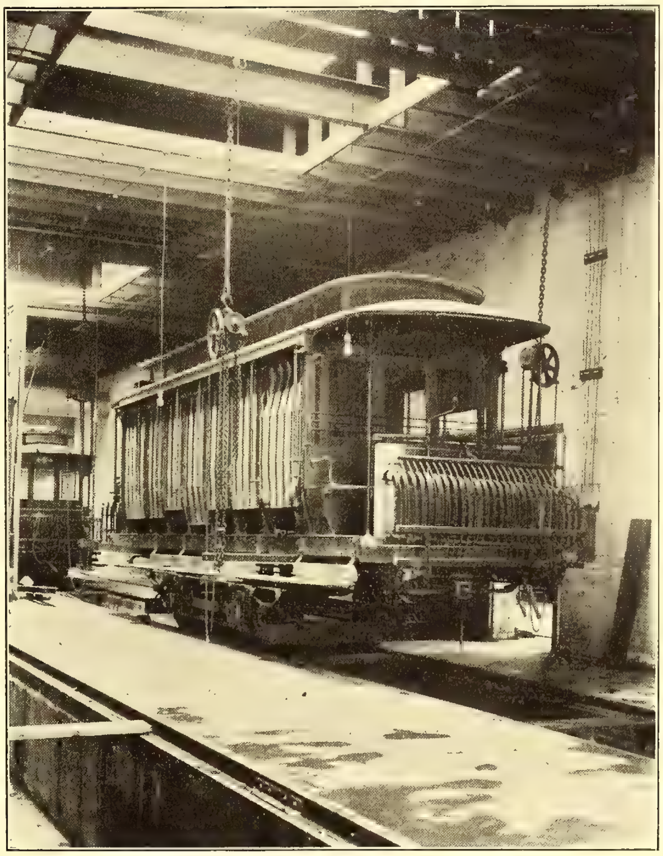
The machine room north of the car shop proper is amply provided with tools for making all ordinary repairs. A view on the opposite page shows the interior of the room. A 5-hp motor drives the machinery, which consists of a 20-in. 6-ft. Mueller lathe, a 26-in. Barnes drill press, an emery wheel and a grindstone. No wheel press or boring machine is required, as all wheel work is done in a neighboring machine shop. The machine room contains, in addition to the tools just mentioned, an air compressor used for blowing out



ROOF CONSTRUCTION OF SHOP, TROLLEY TRAVELING ON I-BEAM AND TROLLEY BRIDGE

motors and controllers. Immediately in the rear of the machine room is the forge room, containing one forge which is provided with a blower driven from the machine-shop line shaft. Behind the forge room is a room given over to the heating apparatus. There is installed in this room a boiler and hot-air heating apparatus, consisting of enclosed coils and a ventilating fan driven by a 6-hp motor.

The store room near the front of the building is well supplied with shelves and racks which enable all the supplies necessary for the road to be carried in the least space possible. The shelves are placed around the walls, while a combination bolt rack and storage space for glass utilizes the



CAR-BODY BEING RAISED FROM TRUCK BY CHAIN HOISTS

space in the center. A waiting room for trainmen is provided with a table and reading matter, and the toilet rooms for the shop are built opening out into it. The office of the system is in that portion of the structure extending out beyond the storage barns and car shops. The main office is provided

ROOF OF REPAIR SHOP, SHOWING VENTILATORS AND SKYLIGHTS

with a lobby and a fireproof vault for the storage of records. A private office for the manager opens off the main office. The shop sets back some distance from the street, and all the space in front is laid with paving brick.

EAGLE POINT PARK

The company operates an amusement resort known as

Eagle Point Park, which embraces 70 acres filled with ravines and glens and covered with fine trees. It is located a few miles north of Clinton on high bluffs about 200 ft. above the river, which at this point is filled with islands. The view obtained from the park is in itself the means of attracting many people to it. In fact, one can see a distance of twenty miles into the country on the opposite side of the river. The park is not yet fully developed, but at present it contains several buildings, and others will be erected during the coming season. As it is high up on the hills where an almost constant breeze is to be found, it is used a great deal during the heated portion of the summer by those seeking a cool retreat. Conventions of various organizations meeting in Clinton usually hold picnics or gatherings at the park, and on the occasion of the merchants' convention more than 6000 people were carried to it. Usually the cars leading to the park are operated on the spur from the main line only, and it is necessary to change cars at the terminus of the spur. On Sundays, holidays and other occasions when travel is heavy, however, through cars are run to the park.

GENERAL VIEW OF THE MACHINE SHOP

VIEW OF THE MISSISSIPPI RIVER FROM EAGLE POINT PARK

SHELTER HOUSE IN EAGLE POINT PARK

A forcible example of what can sometimes be accomplished by reducing fares was shown on the line leading to the park. The fare from the city was formerly 10 cents. This has since been reduced so that one can go from any part of the city to the park for 5 cents. Since the reduction has been made the attendance at the park has been more than doubled. The receipts, of course, are not much greater than they were previous to the reduction, but the management feels that the reduction will in time result in greater receipts due to the growing popularity of the park. In the meantime the company has the satisfaction of feeling that its efforts to make the park popular are being appreciated by the citizens.

OPERATING FEATURES

The management realizes that in a town where the hauls are short every effort must be offered to get the people into the habit of riding. To this end traffic is watched closely and at all times sufficient cars to handle the people comfortably are kept on the line. Special effort is also made to run cars close to the schedule and to keep them clean and comfortable. The necessity of keeping them properly heated is appreciated, and thermometers have been installed in the cars and the trainmen instructed to keep the temperature at about 60 or 65 degrees.

Quite a little revenue is obtained by giving proper attention to theater traffic. In order to take care of this properly the three-way switch at Sixth Avenue and Randolph Street was installed so that cars could be stored on Sixth Avenue. Usually six or eight cars are in readiness after an evening performance at the theater to convey the people to their homes.

The appearance and general demeanor of the trainmen is better than usually found on street railway systems, and this is partly due to the method of discipline in use and partly to the interest shown by the management in the welfare of the trainmen. The merit system of discipline is used. Conductors are given merits or demerits for meritorious acts or for violating rules or unseemly conduct. This method of punishment is preferred by the company to that of laying men off for offenses, as that form of discipline works hardship on their families and increases their own troubles so that they cannot put heart into their work when they are reinstated. And, too, it often happens that a violation is made at a time when the man is needed badly and cannot be laid off. If he is laid off for a week or two after the offense is committed, a great deal of the effect of the punishment is lost. In other places where the merit system is employed it is usually customary to give the promotions to those having the least number of demerits or the greatest number of merits. This company, however, believes it better to give promotions to those longest in service.

No club or organization of the trainmen or employees exists, but the company has provided a waiting room for the employees and keeps it supplied with literature. A locker for each man is also provided. All the trainmen are uniformed and are required to purchase a new suit each spring. In the office the standard method of accounting is employed. This has been varied somewhat to meet local conditions, but it is practically the same as recommended by the American Street and Interurban Railway Accountants' Association. A system of store-room accounting devised by Mr. Howard is in use, which requires very little work to keep it up yet which accounts for all material used and takes into consideration the exact cost of the material.

Until a few months ago the company was known as the States Electric Company. Since that time it has been reorganized and the name has been changed to the Clinton Street Railway Company. The capital stock is $600,000, all paid in, and in addition to this there is a bond issue of $400,000. The officers of the company—C. H. Young, president; D. Langan, vice-president; A. L. Schuler, vice-president, and C. C. Coan, treasurer—all reside in Clinton. In fact, all the stock is owned by residents of Clinton, and the manner in which the system is maintained is due in a great measure to the fact that the stockholders take a pride in it and keep in touch with its operation.

The Hocking Valley Railway, a steam line extending from Toledo to the southeastern portion of the State through Columbus, has been paralleled for more than two-thirds of its length by traction lines. A prominent official of the company has been quoted as saying that the company will not give up its local business without a hard fight, and that its experts are investigating all the gasoline and gaso-electric cars that can be found with a view to adopting something of this description as soon as a practical device can be secured. Local services will be given out of Toledo and both directions out of Columbus.

RIVERSIDE PARK AT SIOUX CITY

A LIVELY BOATING DAY ON THE SIOUX RIVER AT RIVERSIDE PARK

Riverside Park, controlled by the Sioux City Traction Company, Sioux City, Ia., comprises 288 acres of land at the junction of the Missouri and the Sioux Rivers. One portion of this tract is taken up by the building and race track of the county fair grounds, but about 50 or 60 acres is devoted entirely to an amusement park. One of the illustrations shows the pavilion erected near the Sioux River. This contains a theater in which vaudeville performances are presented during about ten weeks of the summer season. Band concerts are also given at intervals on the Sioux River. Quite a portion of the park is cleared of timber and is utilized as a golf course and ball grounds. Several boat clubs have their headquarters at the park, and quite a number of summer cottages have been erected on the grounds by the residents of Sioux City. The Sioux River, opposite the park, offers special inducements for bathing and boating. At about its middle point is a long, narrow island, which makes the view from the park especially attractive.

FRONT VIEW OF PAVILION IN RIVERSIDE PARK

The Clover Leaf Railroad has effectively acknowledged the effect of interurban competition. According to an affidavit filed with the Indiana State Tax Board, the passenger traffic of that road has dropped off 95 per cent between points of interurban competition. The officials of the road say they are now building motor cars at the company's shops in Frankfort to compete with the trolley cars.

OPERATING RESULTS ON THE LANCASHIRE & YORKSHIRE ELECTRIC DIVISION

Readers of this paper are acquainted with the fact that about two years ago the Lancashire & Yorkshire Railway Company, one of the most important steam railroads of England, electrified the portion of its line between Liverpool and Southport, a distance of some 18 miles. This division embraces 47 miles of track and a power and transmission plant of 12,000 hp. Descriptions of this system, which was installed by Dick, Kerr & Co., the well-known British contractors, appeared in the STREET RAILWAY JOURNAL for Jan. 9, 1904, and April 2, 1904. Since the publication of these articles the line has been extended, and data are available upon the results secured. In general they can best be described in the words of the chairman, Sir George Armytage, delivered at the meeting of the company in August, 1905. The improved traffic is referred to in the following words:

The electric service upon the Liverpool, Southport & Crossens line during the last six months has been quite satisfactory, and has been appreciated by the vast majority of the people who have used it, as we have carried no less than 600,000 additional passengers with ordinary tickets. Our season tickets have also largely increased in number. The amount of building which is going on upon the line in consequence is also very gratifying, showing that it has done what we hoped it would do in attracting a large number of people to go and live out in this district. As to the cost of working, we have only had six months' experience as yet of the complete electric service, and we think we shall be better able to judge of the actual facts as to the cost of working when we have had a complete twelve months' experience of operation. It is, however, clear that it would be impossible to give the public the great advantages which they have in rapidity and frequency of service by any other method than by working electrically. There are, in addition, other indirect advantages to be considered; one, particularly, is the reduction of operations necessary at the terminal station, as the train can leave the platform it arrived at without any shunting, and this alone will postpone the necessity for enlarging the Liverpool station for some time to come. The short connecting line between Seaforth and the Liverpool Overhead Railway was brought into operation on July 2, and this additional convenience to the public will no doubt develop in time into an important feeder.

A further experience of eight months confirmed Sir George Armytage in his opinion of the operation of the line, for at the half-yearly meeting held on March 7 of this year he said, in reference to the cost of operation:

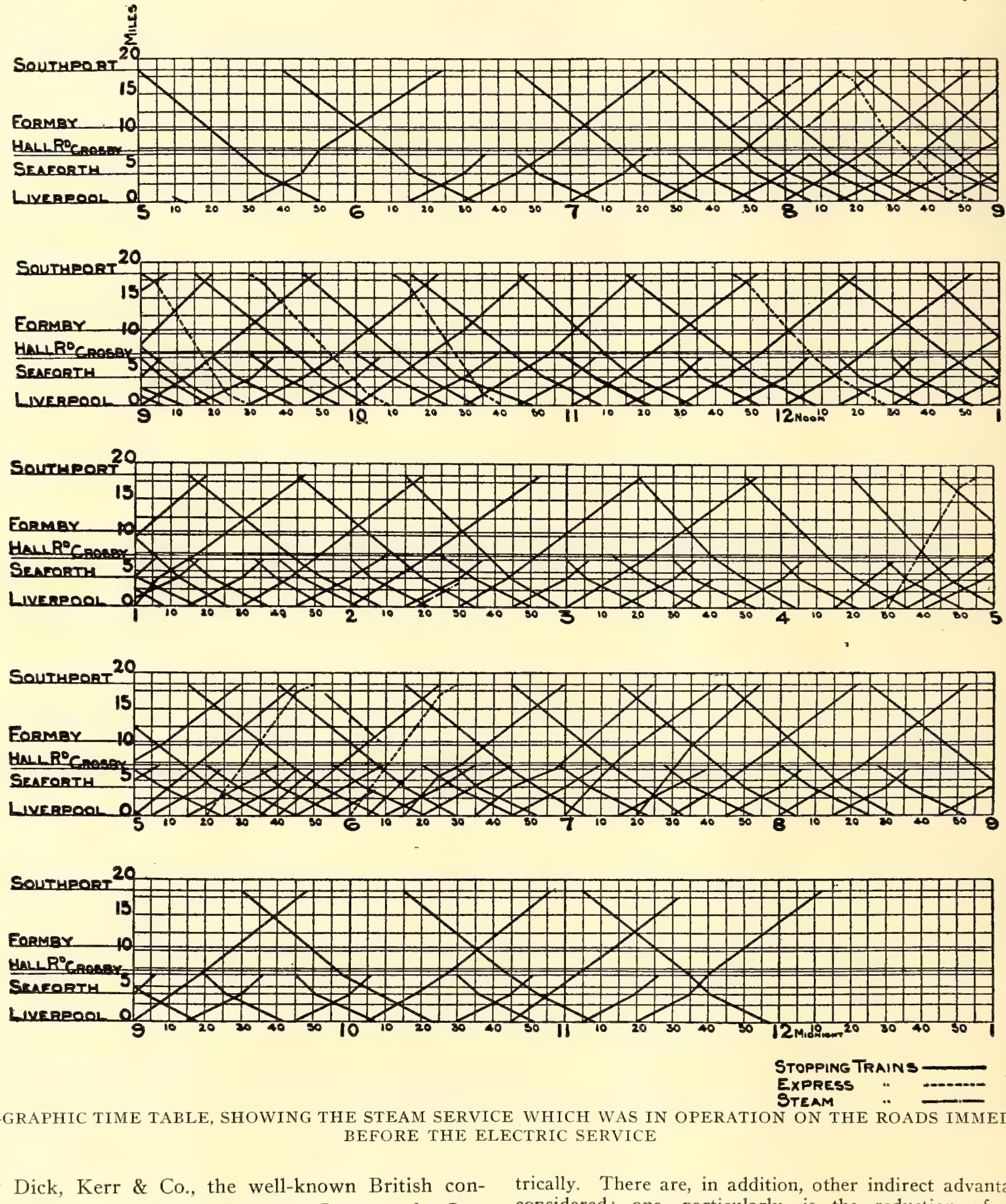


FIG. 1.—GRAPHIC TIME TABLE, SHOWING THE STEAM SERVICE WHICH WAS IN OPERATION ON THE ROADS IMMEDIATELY BEFORE THE ELECTRIC SERVICE

With this we are quite satisfied, and we have been able to do a much greater amount of work, and give a very much improved service to the public, which would have been absolutely impossible under the old conditions. We are now contemplating some additions which will enable us to deal with the rapidly growing traffic as it arises. We have again carried very large additional numbers of passengers over the electrified portion of our railway, especially for short distances, and the whole system is working smoothly and well.

The total length of the line which has so far been electrified amounts now to nearly 60 miles of single track. This includes the extension from Southport to Crossens referred to in Sir George Armytage's address, as well as one of the branches which links up the Liverpool Elevated Railway with the Liverpool Southport line at Seaforth. The characteristics of the line and its extensions are level and straight. There are practically only two grades, one of 1 in 100 at Churchtown on the Crossens extension, and the other of

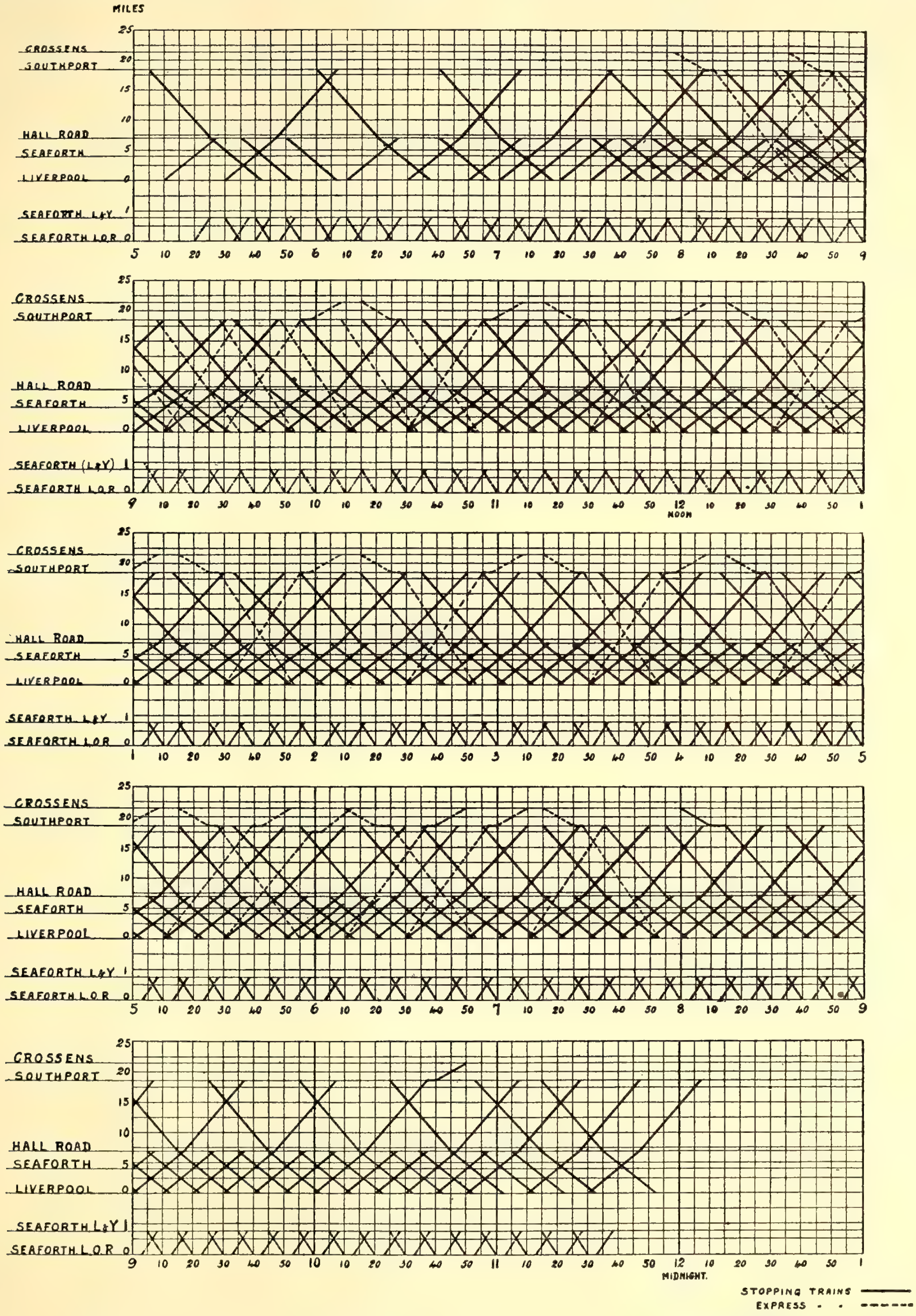


FIG. 2.—GRAPHIC TIME TABLE OF ELECTRIC SERVICE ON THE ELECTRIFIED DIVISION OF THE LANCASHIRE & YORKSHIRE RAILWAY

about 1 in 112 for a short length at Seaforth. There are only two curves to be considered, and over these there is a speed limitation of 40 m. p. h. There are fourteen intermediate stations, which lie at an average distance of less than one mile apart on the southernmost portion of the route, but are more widely separated on the northern portion. The traffic is almost wholly passenger, business people going to and returning from Liverpool in the morning and evening, with a considerable shopping and miscellaneous traffic during the day.

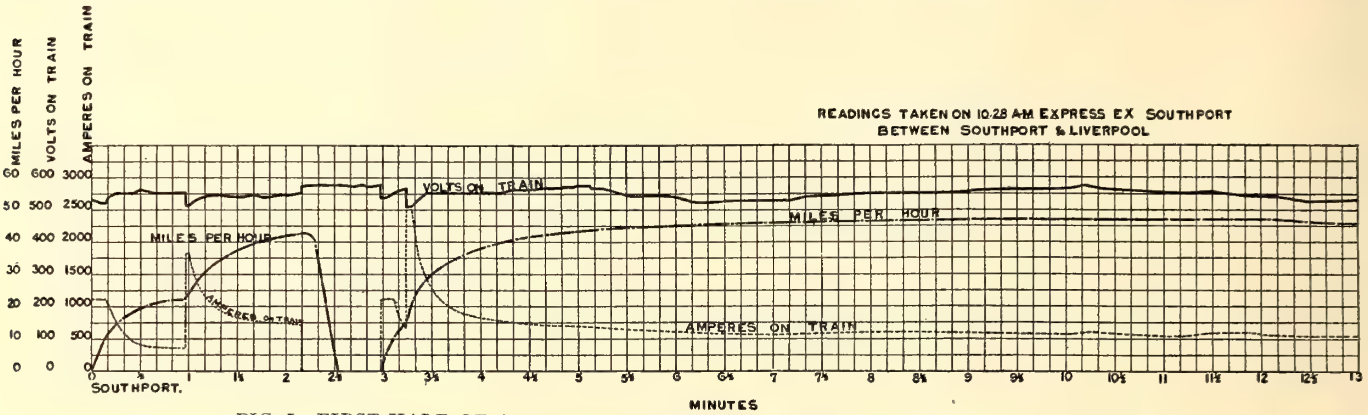


FIG. 5.—FIRST HALF OF A TYPICAL EXPRESS RUN FROM SOUTHPORT TO LIVERPOOL

ELECTRICITY VS. STEAM

Under steam conditions there were about thirty-six trains per day in each direction between Liverpool and Southport, a similar number running in each direction between Liverpool and Crosby, a station some 6½ miles from Liverpool. The majority of these trains stopped at every station, a few expresses being run in the morning and evening for the accommodation of the business men. The running times were as follows: Express trains, 25 minutes; stopping or way trains, 54 minutes; Hall Road stopping trains, 25 minutes. The total train mileage per diem was about 1900. Fig. 1 is a graphic time-table, showing the steam service which was in operation on the roads immediately before the electric service was inaugurated; and Fig. 2 is the time-table to which the electric service of the line is now being run.

Under electrified conditions the daily train mileage has been increased from 1900 to 3500. The number of trains in each direction between Liverpool and Southport has been increased from 36 to 70, and between Liverpool and Hall Road from 36 to 60. Moreover, the running time from Liverpool to Southport, which before the initiation of the scheme was 54 minutes, has now been decreased to 37 minutes, and from Liverpool to Hall Road from 25 minutes to 17 minutes. The schedule time of the fast trains has remained unaltered; but there is now an express in each direction hourly, instead of only rarely. In addition to this, all the express trains now run on to Crossens, giving that suburb a service of seventeen trains each way during the day. These arrangements, however, by no means represent the ultimate capacity of the line, and indeed already very considerable extensions are in contemplation, while some of these are being actually proceeded with.

ELECTRIC TRAINS

The trains consist of two motor cars and of one, two, or three trailers as required. The five-car trains are operated during the rush hours of morning and evening, and the light trains during the slack hours of the middle day and early afternoon. The empty weight of the motor cars is about 46 tons, and that of the trailers 26 tons, so that a three-car train weighs 118 tons, a four-car train weighs 144 tons, and a five-car train weighs 170 tons. In addition to these passenger carrying vehicles, a baggage car, weighing 32 tons, is in constant operation on the line, running conveniently between the scheduled time of the trains, and dealing with baggage,

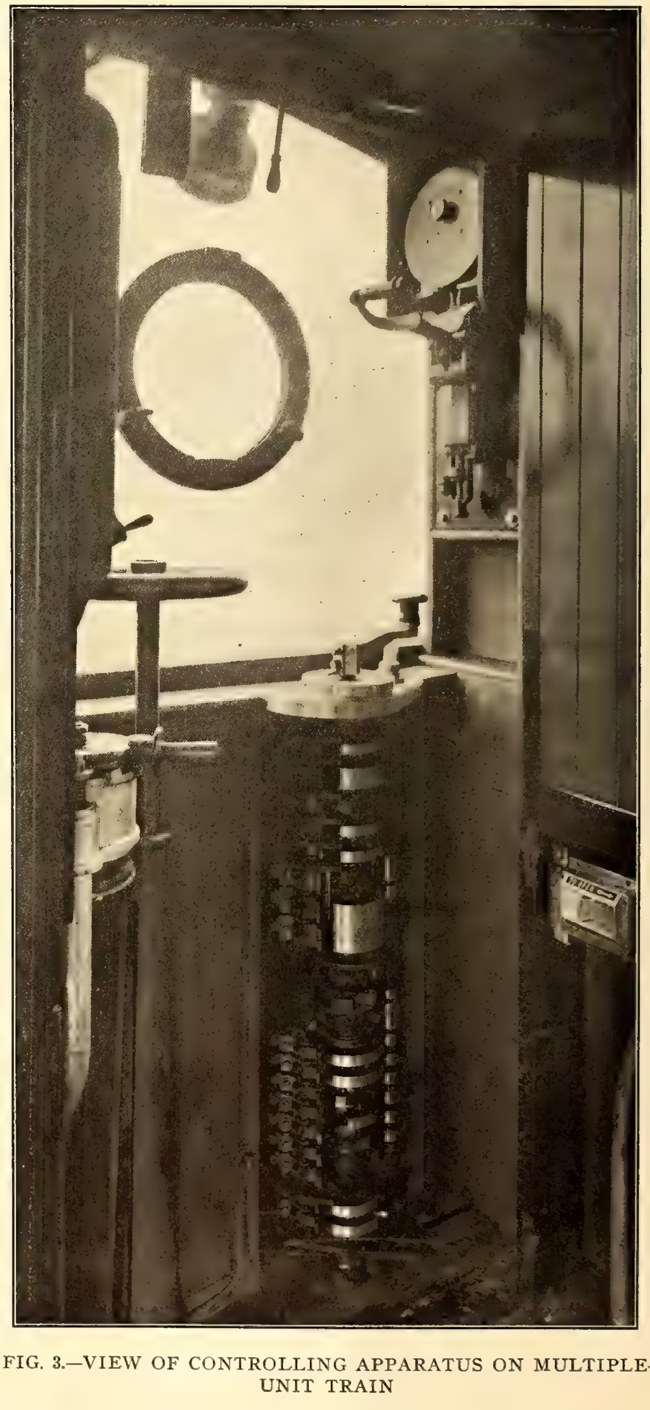


FIG. 3.—VIEW OF CONTROLLING APPARATUS ON MULTIPLE-UNIT TRAIN

goods, produce, fish, etc., which cannot be handled during the fifteen-second station stops, at which passenger trains aim.

TWO-MOTOR CAR VS. MULTIPLE-UNIT SYSTEM

As described in the Street Railway Journal for April 2, 1904, the original electrification was on the two-motor car system. That is, a train always included two motor cars, one at either end, equipped with two motor trucks, each car-

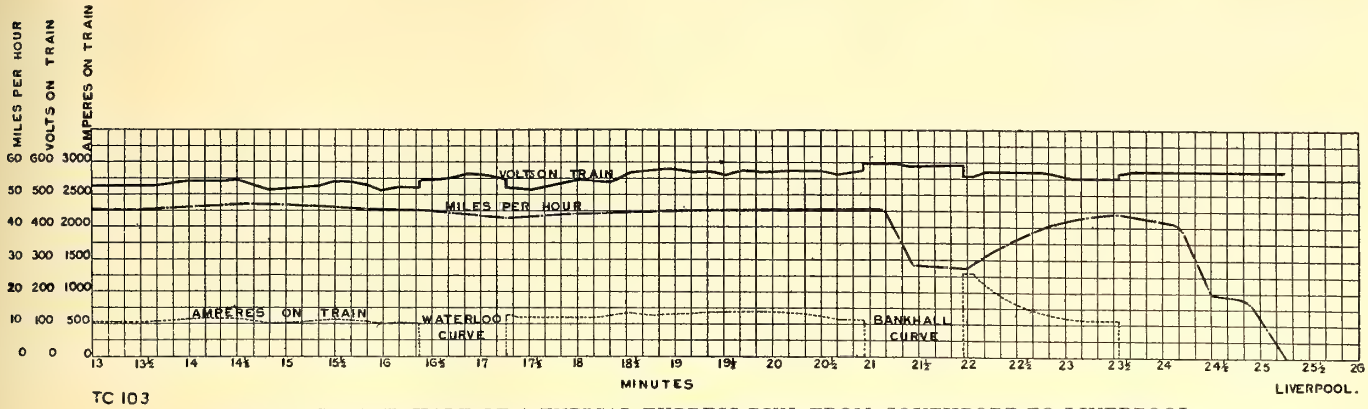


FIG. 5.—SECOND HALF OF A TYPICAL EXPRESS RUN FROM SOUTHPORT TO LIVERPOOL

rying two Dick, Kerr 4A, 150-hp motors, or eight motors per train. The controller was fully described at the time, and, briefly, consists of two controller cylinders geared together and operated by one handle; one cylinder controls the four motors of the leading car and the second cylinder the four motors of the rear car. By the use of solenoids for magnetic blow-outs, currents of 2500 amps. at starting are handled by this controller satisfactorily.

On June 1 the company commenced running some of its trains into Liverpool over the Liverpool Elevated Railway. Owing to the loading strength of the structure these trains had to be considerably lighter than those operating over the rest of the line, and the multiple unit system has been installed on the cars which run over both systems. In this way the trains can be divided up at the junction of the two

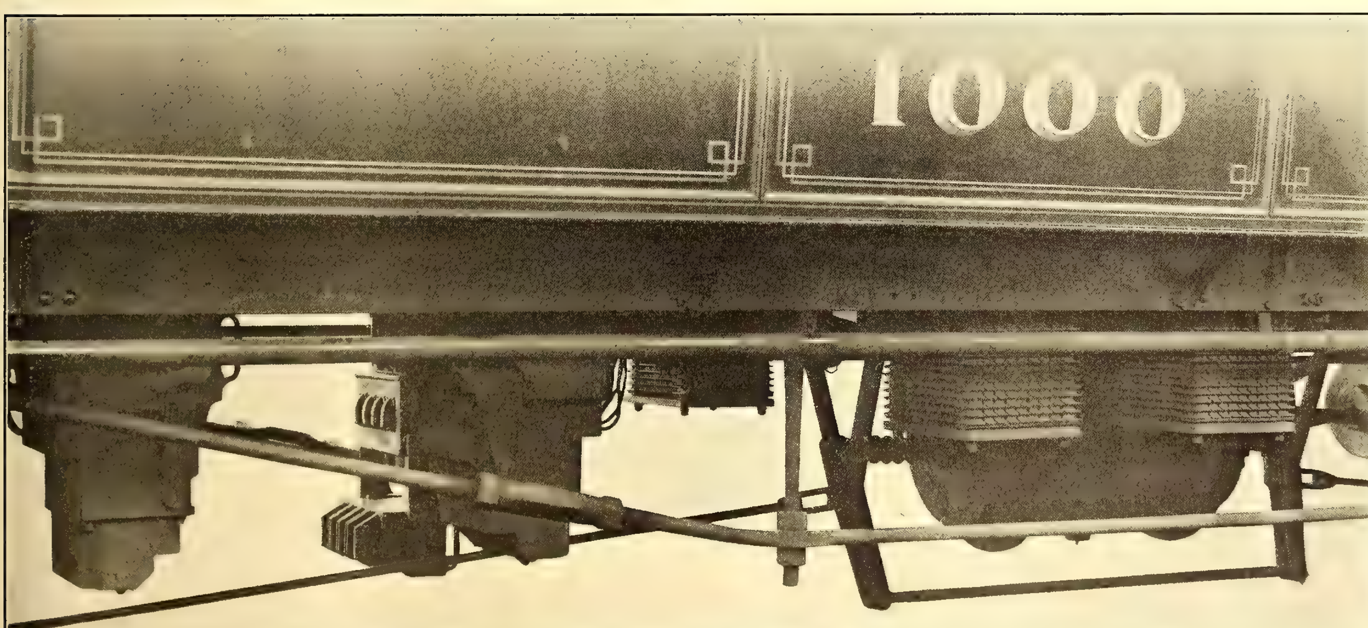


FIG. 4.—ARRANGEMENT OF RESISTANCES AND CONTACTORS UNDER THE CARS

systems. The use of the multiple-unit system, however, is confined to such trains as operate on both lines, and on trains which have been recently added to the Lancashire & Yorkshire system, which are not required to run on the Liverpool Overhead Railway, the locomotive system of control has been adhered to. Fig. 3 is a view of the controlling apparatus on a multiple-unit train, and Fig. 4 shows the arrangement of the resistances and contactors under the coaches.

ENERGY CONSUMPTION

Tests made by the contractors indicate that the average amount of energy taken by the four-car way trains which make the run from Liverpool to Southport in 37 minutes is about 80 watt-hours per ton-mile. The expresses between Liverpool and Birkdale absorb only 53 watt-hours per ton-mile. The current composition per ton-mile over the whole system is 82.3, but this will be understood and appreciated when consideration is given to the frequency of the Hall Road service, and the station density at that end of the line. Curves are given in Fig. 5 of a typical run of an express train.

POWER-STATION CHANGES

The original power station was designed for the operation of twelve trains, but almost from the first fifteen were found necessary, then a ten-minute service between the Liverpool Overhead and the Liverpool-Southport lines was established, and, later, other trains were added. This naturally involved a heavier power-house output than was initially contemplated. Instead, however, of increasing the capacity of the power house to meet this demand, the railway company determined, upon the advice of its contractors, to put down a comprehensive system of storage batteries which should be capable

of dealing with the severe peak loads inseparable from the electrical working of a railway whereon a fast and frequent service, short runs between many stations, and high acceleration have to be maintained.

The batteries selected were those made by the Tudor Accumulator Company, and these, after careful consideration of all the questions involved, it was determined to put into four battery sub-stations. These are located between the rotary sub-stations and have capacities ranging from 1000 amps. discharge for one hour, or a maximum output for a short period of 2500 amps., to a 1600-amp. hourly discharge rate, or a maximum output of 4000 amps. Each battery is controlled by an automatic reversible booster of suitable capacity, the plant consisting of a motor, which is shunt-wound, directly connected to a booster which is capable of giving all necessary increase in voltage.

The electrification of one of the other branches will necessitate the erection of another sub-station, which is to be located at Aintree, and which is to be provided with two rotary transformers, each of 600-kw capacity, with necessary statics, etc., each unit being a duplicate of that originally installed in the earlier sub-stations. Housed in the same building will be a Tudor battery capable of giving a continuous output for one hour of 1500 amps., and this battery will be connected to the third rail through a reversible booster, in a manner similar to that which has been adopted so successfully at the other stations. The sub-station at Aintree will be connected by means of high-tension cables with the rotary sub-station at Seaforth, as, owing to the ample section of the trunk mains from the power house to this point and the equalizing of the load through accumulators, it will not be necessary to reinforce the main high-tension cable system.

It will be noted by reference to the previous article that the alternators, which are of 1500 kw, generate at 7500 volts and 25 cycles. Power is distributed at this voltage to four rotary sub-stations, including one at the power station. Direct current is taken by the cars at 650 volts from a third rail which is located 3 ft. 11½ ins. from the center line of the track and whose top is 3 ins. above the surface of the track rails. For the return circuit the company uses a fourth rail spiked to the ties and located midway between the service rails. The fourth rail is cross-bonded to the running rails and is omitted within the terminals and at the large stations, where the track work would be complicated by its introduction. In view of the controversy now going on in both England and America as to the relative advantages of the third-rail and overhead systems, it is interesting to learn that the third rail on the Lancashire & Yorkshire line has proved very satisfactory. Soon after the opening of the road there were, it is true, a few fatalities, but for considerably over a year there has been nothing in the nature of a serious electrical shock or accident, although much of the track work is complicated. The cost of renewals of insulations, bonds, and other details connected with the third rail of the system has been almost negligible, where the insulators have been well set and the rail properly anchored, and in the case of the insulators the renewals have amounted to less than 300 per annum out of 30,000, or less than 1 per cent.

Experiments on the loss of current by leakage from the third rail indicate that on wet and slushy days, and after prolonged rain or snow, the loss is less than 2 amps. per mile. In starting up on a Sunday morning after a wet or snowy Saturday night the leakage current has been known to exceed this for a very short period, but as a whole the leakage may be regarded as negligible.

FIG. 6.—NEW MULTIPLE-UNIT CAR ON THE LANCASHIRE & YORKSHIRE RAILWAY

"THE ROUTE OF THE MINUTE MEN"

This is the title of a traffic booklet issued by the Lexington & Boston Street Railway Company, describing and illustrating the route of the minute men, followed by the company's lines. Along the route are such places of historic interest as the battle ground at Lexington, Hancock-Clark house, Monument Square in Concord, Sleepy Hollow Cemetery, and Lexington Park.

The cover of the pamphlet is surmounted by a picture of the statue of Captain John Parker, commander of the minute men at the Battle of Lexington. Five pages are then devoted to advertising. Beginning the descriptive matter is "Paul Revere's Ride." Following this is a picture of the statue of a minute man on Concord battle ground. In the descriptive matter is included the story of each of the places of interest, making the booklet extremely valuable.

It is reported that about Aug. 1 the United Railways, of St. Louis, began to run a refrigerator car over its lines to convey dressed beef from the St. Louis Dressed Beef Company on Manchester Avenue and Gratiot Street, to its three other branches. A car has been built for the purpose by the United Railways Companys, at a cost of $6500. It has a capacity of 40,000 lbs. The dressed beef company will dispense with about forty wagons when the new service is installed. The railways company claims the right to carry express matter under its franchise. It also claims that dressed meat carried in the manner indicated is express and not freight. It is asserted that the meat will be carried mostly at night and when the lines are little used.

FROM A CONDUCTOR'S POINT OF VIEW

SIGNALING BY PASSENGERS

It seems to be taken for granted by many persons that when they are being carried past their destination they are privileged to pull the bell strap three times—the emergency stop—thus bringing the car to a sudden standstill. There is a law in many States making this a misdemeanor, and notices to this effect are posted on elevated cars. Similar announcements should be posted on street cars, and the rule should be vigorously enforced.

ASSIGNMENT OF RUNS

The placing of certain employees in localities especially suited to their peculiar abilities or disabilities is a matter to which street railway companies have not given much attention, yet it is an important consideration in the practical operation of a road. On many short feeder lines a mile or two in length one often finds young, vigorous motormen of several years' experience, operating the cars, free from the annoyances caused by trucks, burned-out motors or other difficulties. If they do get into trouble they will not block up the road, and the loss of a half trip would make only a few minutes difference. On the other hand, there are men on the main lines who have served from twenty to twenty-five years as motormen, and who if kept in the service at all should be placed where the work is lightest.

Again, one will find conductors on certain runs for which they are unsuited. It is a fact that certain regular riders will let cars go by them if they think that by waiting for a certain car they will get a new conductor who can be cheated out of his fare. Moreover, with nearly every company the crews work to some extent in rotation, so that it may often happen that a light or inexperienced conductor will take a car carrying a crowd of beats, or a tough picnic or ball crowd, with consequent loss of fares to the company. The writer knows of a certain isolated locality where a slight young lad used to get on his run every evening a mob of foreigners who would actually steal the nickels out of his pocket, besides pulling down the trolley and setting the rear brake, to say nothing of cheating him out of his fares. If there was a rule allowing starters to change the personnel of a run used by toughs, and to assign it to an experienced conductor, these conditions would be considerably improved.

Another way in which the red tape of rotation operates against the interests of the companies is in keeping the same crews continually in one depot or city. Suppose one man is holding a pretty fair run in one city and another in another city on lines of the same company. One man wishes to change, but if he does he loses his standing and has to go to the bottom of the extra list in the new depot. This is a bad rule, for if two men in different depots wish to change they should be allowed to take each other's runs. And if a company wishes to change two men they should do so and place them on their respective runs.

SUGGESTIONS FOR UNIFORMS OF CONDUCTORS ON OPEN CARS

Now that the open-car season is at hand, the question arises should not something be done to reduce the danger of conductors tripping when using the running-board. Some time ago the writer had an ugly fall caused by his trousers catching on some projection while he was collecting fares on an open car, and he has known of a number of cases of this kind. With a crowded open car the conductor has to spend considerable time on the running board, and it would seem a simple device, such as bicycle clips, would reduce a great deal of danger from this source. If the company wished to go further, it could provide military leggins or even knickerbockers. The latter may seem considerable of an innovation, but an example may be found when the bicycle police squad was organized. Now the sight of a policeman in short trousers or with leggins is not unusual and causes no comment. Leggins would give a military appearance to the men and might be preferable for this reason. There are also advertising possibilities in the idea, because if it became generally known that a road was planning to introduce a change of this sort many people would be attracted by the novelty until it became an old story.

KEEPING THE HANDS CLEAN

In the midst of hot weather, one of the serious problems, both to the street railway manager and to the street railway conductor, is the unclean condition into which the hands of the latter necessarily get on account of contact with dusty parts of the car, sweating, etc. The conductor can easily wash his hands by using soap and water, but to dry them is the difficulty. For this reason we see so many conductors with dirty hands. It is hardly practicable to provide toweling enough for say 200 men, and even if this were done outsiders would take advantage of it. A simple remedy would be for the janitor to take the old newspapers that accumulate, cut them into single strips about 11 ins. x 14 ins., and hang them on a nail. If this were done a conductor could hastily run into the wash room, wash his hands and dry them on a slip of paper.

SANDING RAILS

When a rail gets slippery on damp or foggy mornings, or from leaves falling on the ground, it is necessary to have the tracks sanded from one terminus to the other, and there is a call for the sand car. Sometimes this car cannot be sent out in a hurry. Perhaps the men are not at hand, the sand may not be ready, or the car itself out of order. It is obvious that delays in a case of this kind are dangerous, and a plan to get a division sanded in a quicker and less expensive manner is worth considering.

Every car has a sand-box at each end, so that when a car is running north, for instance, the motorman has the sand-box at the end to sand his track, and the sand-box at the south end of the car is inactive. A quicker way to get the division sanded would be for the starter to take some conductor or motorman and instruct him to board a car and work the sand-box on the rear of the car until it is empty. The man could tell this by looking at the track. Then he could leave the first car, board the next car, and work the sand-box in that car until it was empty, repeating the operation until the entire division was sanded. Where the car house is in the center of the route, one man could board the north-bound and another the south-bound car

THE TRANSFER QUESTION

An active discussion is going on in New York owing to a couple of new rules recently made by the local management. One of them requires a passenger to ask for a transfer when he pays his fare, and the other prohibits smoking on the rear platforms of street cars. Despite the clamor of the newspapers and a portion of the public, it cannot be said that the position of the railway company is unjust. It is certainly no harder for a passenger to ask for a transfer when he pays his fare than at any other time. On the other hand, it considerably lightens the work of the conductor and enables him to give more time to looking after the safety of his passengers. Of course this rule is also beneficial to the company, as it avoids the possibility of fraudulently-inclined passengers getting more than one transfer. The law does not require a company to give

two transfers, and no fair-minded person can deny that the company has the right to adopt reasonable regulations to protect itself against fraud. Regarding any rules about transfers and smoking, the writer has noticed in several cities that some conductors enforce them and others do not. This is certainly an injustice to those that enforce the rules, and the company should see that no man is allowed to shirk his duty.

Recently a large Eastern traction company put a rule into force requiring conductors to give a transfer upon a transfer. As matters now stand, owing to the peculiar routes of the system, a party can start on a car and ride indefinitely. The rule was made, however, because it is sometimes necessary to ride on three lines in going between certain portions of the city. When a passenger gets one transfer on another, he is doing very well, but to prevent indefinite riding the following suggestion is offered: When a conductor gives a transfer on a transfer, have him tear a small piece off of the corner of the transfer issued. This is a notice to the next conductor to issue no more transportation on that transfer.

"FARE, PLEASE"

A street car company should prohibit its conductor from using "Fare, please," except in extreme cases. The writer tried the experiment, while connected with one of the largest electric roads in the country, and found that in conducting his car without using such an expression he made a vast improvement in his work. At first it was exceedingly hard, but he soon noticed that the very hardness made him extremely sharp and watchful. And when he came to some one not inclined to pay promptly, "Fare" yelled at that individual would produce an extremely healthy activity in the direction of the desired nickel.

STORE-ROOM ACCOUNTING ON THE CHICAGO & MILWAUKEE ELECTRIC RAILROAD

The quantity of material handled, the number of different kinds of stock kept, the fact that prices change at almost every purchase and other unusual features, makes it rather difficult to devise a satisfactory system of accounting for the store room and supply department. The system in use by the Chicago & Milwaukee Electric Railroad is of interest because very little clerical work is required to keep it up, reports are gotten out promptly at the end of the month, and the stock on hand is always known. The store room is run by the car maintenance department, which, in turn, is under the jurisdiction of J. L. Matson, superintendent of motive power of the system. Requisitions for material are usually

Chicago & Milwaukee Electric Railroad Co.
DAILY REPORT OF MATERIAL RECEIVED.
Date 3 - 5 190 6

	QUANTITY	WEIGHT	ARTICLE	FIRM	FREIGHT OR EXPRESS	ORDER NUMBER	DATE OF INVOICE	REMARKS
	100		✓Brake Shoes #2	✓A B Co	$42-2d Exp	6845	3-1-06	Sup.
	2		✓Bottles Paste, qts	X N B Co.	Am x Pacif	6843	3-2-06	#27

I certify that the above is correct as indicated in first column, except as noted hereon.

STOREKEEPER

DAILY REPORT OF MATERIAL RECEIVED

made out by foremen, but, in case time would be lost in hunting for a foreman, the storekeeper makes them out, writing in the proper blank space the name of the employee to whom the goods are delivered. Requisitions for goods for other departments than that of car maintenance are made in duplicate. Each day the copies of all the requisitions made for departments other than that of car maintenance are sent to the heads of the departments, who check them in order to see that no goods not needed have been drawn. Any attempts at theft or improper use of material by employees would by this means be detected at once. For the car maintenance department, the original requisitions themselves are examined and checked, as the store room is under this department.

Chicago & Milwaukee Electric R. R. Co.
MEMORANDUM OF GOODS RECEIVED

To the STOREKEEPER,
Highwood, Ill.
A partial shipment has been received
from ____ on our order and requisition as indicated.
Order ____
Requisition ____

Quantity Received	Quantity Ordered	ITEMS	Date Received

I certify that the above material has been received in good order (except as noted hereon) on the dates indicated in last column, and that the quantities indicated in the first column are correct.

MEMORANDUM OF GOODS RECEIVED

To assist in accounting the material in the stock room is classified under heads designated by the letters of the alphabet. Class A consists of bolts of all kinds; B of tools, including brooms, mops, drills and buckets; C is car motor repair parts, and D is air compressor and governor repair parts. The list continues in a similar manner through the alphabet. Every five days all the requisitions are arranged according to the classification of the goods issued on them and the prices of the goods delivered is marked direct on the requisition itself.

The prices are obtained from the stock record. This is made up in the form of a loose leaf ledger, a page of which is given over to every kind of material carried. Consequently, there are several pages for each classification of material. Under

Chicago & Milwaukee Electric Railroad Co.
STOCK RECORD

OUR STOCK NO. MFR'S STOCK NO. MAXIMUM MINIMUM

ORDER Date	ORDER Number	Firm	Date of Bill	Total Cost	Cost per	Date	QUANTITY Received	QUANTITY Issued	QUANTITY On Hand	Remarks

STOCK RECORD

Class A, for example, a page is used for each kind of bolt, machine bolt, lag bolt, carriage bolt, and others. After the

Form 13 10M 10-06

Chicago & Milwaukee Electric Railroad Co.
REQUISITION FOR SUPPLIES No. ____
Station ____ Date ____ 190
StoreKeeper will deliver the following to ____

QUANTITY ON HAND	QUANTITY REQUIRED	DESCRIPTION OF ARTICLES REQUIRED	PRICE	TO BE USED FOR	CHARGE ACCOUNTS	CAR NO.

I CERTIFY That I have examined this requisition, the articles are required for the use named and the quantities are stated correctly. Same is hereby APPROVED

HEAD OF DEPARTMENT

FOREMAN

REQUISITION FOR SUPPLIES

requisitions for the five preceding days have been arranged in order it is a very easy matter to mark the prices.

As a general rule, only supplies coming under one account, as designated by the standard system of street railway accounting, are entered on one requisition. The total price of each requisition is then entered on an account sheet in its proper place. The amounts under each account are totaled

every five days, and at the end of the month the six sub-totals added together give total cost of goods issued on each account. These totals are entered on the monthly report, under the proper headings.

Entries of material given out, as obtained from the total of the requisitions made for the period, are made on the stock record every five days. Material received is entered on this record each day, and after each entry the amount of stock of the particular item on hand is obtained by subtraction or addition to the amount previously in stock. The stock record book is of such a size that it will last one year at least, and in most cases from 3 years to 5 years, without making out new sheets.

A notice on the order blanks requests that firms from whom goods are ordered make out in triplicate invoices of the goods on forms furnished by the railroad companies with the order. On receipt of the invoices, the original is passed by the heads of the departments, and is forwarded to the auditing department. The duplicate of the invoice is kept in the store room, while the triplicate is kept in the purchasing agents' department. The three forms are printed in different colors, to facilitate in distinguishing between them. When goods are received, an entry is made on a sheet entitled "daily report of material received." Goods for delivery direct to the office or to some department are not entered on the store-room stock record. On the Chicago & Milwaukeep Railroad the clerical work necessary to keep up the system described requires but a portion of one man's time.

NOTES ON SHOP PRACTICE AT DES MOINES, IOWA

The fact that the cars of an electric railway system have a clean and well-kept appearance is a sufficient guarantee that the shops of the system if inspected will disclose many features of practice and many methods of doing things that are of interest and of benefit to shop superintendents and master mechanics of other systems. The shops of the Des Moines City Railway, Des Moines, Ia., are no exception. Through the courtesy of J. E. Welch, master-mechanic of the system, some of the more important features of practice in these shops are here published.

The shops cannot rightfully be termed repair shops alone, for practically all of the rolling stock of the company, including passenger and express cars, is built in them. Recently the private car Iowa, with steel bottom framing, was also completed in these shops, and last year a 30-ton locomotive was built. All the castings, both iron and brass, for the cars constructed in the shops, and even the bell of the locomotive, were cast in the shop foundry.

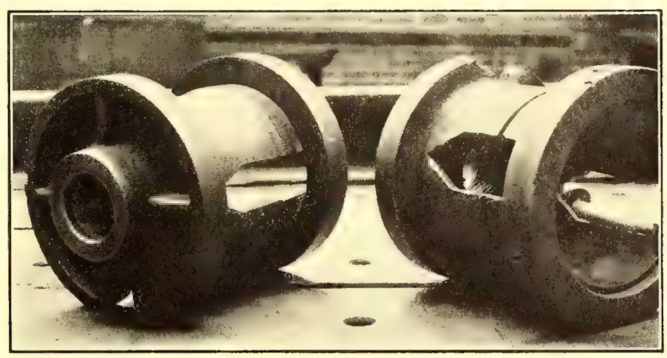
The practice in the paint shops varies considerably from that usually found. When new bodies are painted they are not given the customary guide coat and rub-down with pumice stone, but are simply sandpapered off. This, of course, does not give the appearance that is obtained with the more costly method, but Mr. Welch considers that the benefits resulting from rubbing the cars down in the usual manner and applying so many coats of color and varnish in succession are not sufficient to repay the cost. He believes that as the better effect is noticed by probably but one person in one hundred, it is better to put the extra money in the maintenance of the car after it leaves the shop by bringing it in and varnishing it at frequent intervals. In painting new cars the twelve-day Sherwin-Williams system is usually followed. Occasionally, however, painting has been rushed considerably without hurtful effects. In one instance when new cars were needed badly they were painted from the priming coat to the finishing coat in six days. Some cars painted in seven days were given the following coats in succession: One coat of primer, two coats of rough stuff, one ground coat, one coat color and two coats of varnish. These cars were not returned to the paint shop until the following year, when they were revarnished, and it was four years afterward before they were recolored.

THE FOUNDRY

Three men are employed constantly in the foundry. Besides brass furnaces a 2-ton cupola furnace is installed here. Castings of all descriptions are made, but a great deal of the work in the iron foundry consists in casting brake shoes. For the city cars these are cast without inserts, as the increased breaking pressure necessary with inserts is not considered desirable on account of the city cars being equipped with hand brakes only. In casting the shoes, scrap iron, mixed with a sufficient amount of pig iron, is used. In this manner the scrap iron, which would otherwise be disposed of at a low cost, is utilized. In the brass foundry all the brass fittings for the cars are cast, as well as much of the brass line material, such as overhead switches, cross-overs and hangers.

OILING CARS

Grease has been abandoned entirely in the motor bearings



CHUCK FOR TURNING BEARINGS

of all cars. An oil box provided with a wick feed is placed in the grease box, and Galena car oil is used. The oil does not feed when the car is standing still, and one cup of oil lasts about one week or about 1400 miles. The boxes are of sheet iron and were made in the shop at a cost of 15 cents each.

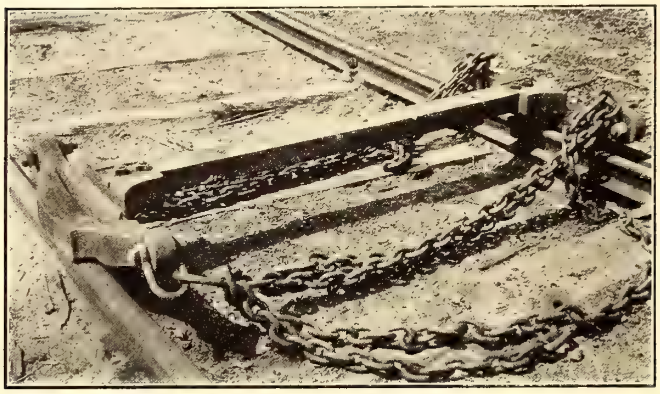
CHUCK FOR TURNING BEARINGS

For turning up babbited bearings chucks of the style shown in the accompanying illustration are employed. These are screwed to the center of a regular machine lathe, and consequently no time is lost in centering them. The cylindrical shell is but about ¼ in. thick and is grooved and slotted so that it is somewhat flexible. With the heavy ring on the end of the cylinder screwed forward, a bearing to be turned can just be slipped into the cylinder. After the bearing is inserted the ring is turned back by hand and the bearing is gripped on all sides by the slight springing of the cylinder. For bearings with smaller outside diameters cylindrical bushings are provided, and by the use of these one chuck may be employed for several different sizes of bearings. The great advantage in the use of this style of chuck is that no time is lost in centering a bearing.

SKID FOR BROKEN AXLES

When an axle breaks on a car it is frequently customary to chain the axle up and drag the car into the shop, and by so doing flatten a pair of wheels. To save the wheels and to quicken the work of getting a car with a broken axle off the track and into the shops, Mr. Welch uses the skid shown in the illustration. This consists of two cast-iron shoes bolted together to the gage of the track by a heavy bar and fitted

with chains for fastening it to the car body. The underside of the shoes is provided with flanges so that the skid will be kept on the track, and the upper side has recesses for the



SKID FOR BRINGING IN BROKEN AXLES

flanges of the wheels. In case of an axle breaking on a car, the car is jacked up and the skid placed under the wheels on the broken axle. The skid is then chained in position to the truck and the car dragged into the shop. The shoes, of course, wear out rapidly, and it is necessary to replace them every three or four trips, but the expense of replacing these is incomparable to the cost of replacing flattened wheels.

BUSINESS-GETTING METHODS OF THE IOWA & ILLINOIS RAILWAY COMPANY

The Iowa & Illinois Railway, of Clinton, Ia., under the management of P. P. Crafts, has been pursuing an active business-getting campaign during the past year. In general, the advertising methods pursued have been such as to impress all within a radius of 100 miles or more of the existence of the road, and to keep the road constantly in the minds of the people in the terminal towns and the immediate vicinity. Much traffic has been created by liberal advertisements of special events or occasions in the terminal cities. At one time about 2000 large time cards, measuring 22 ins. x 23 ins. and printed on heavy board, were sent to hotels, theaters, steam road stations and other public places in the surrounding towns. Accompanying were requests to post them in conspicuous places, and in most instances this was done. The fact that the time cards were gotten up in an attractive manner was no doubt responsible for the attention given to

THE EMBLEM OF THE IOWA & ILLINOIS RAILWAY

them. A large engraving of one of the interurban cars occupies the upper part of the card. The car body is printed in green while the trucks and background are in black. The symbol "I. & I." is printed in red across the central portion of the car body. Steam road and ferry connections are given below, and the fact that 150 lbs. of baggage is carried free on each full ticket is announced in heavy type. In Clinton and Davenport special attention is given to newspaper and theater programme advertising, and advertisements may even be seen on the waste paper cans on the streets in the terminal cities.

The interurban cars are also used to advantage in advertising. Boards on the cars carry advertisements of different kinds and announcements of special occasions or events in either of the cities. These car advertisements and announcements are now printed on standard forms, the symbol "I. & I." taking up the lower portion of the paper which is pasted to the billboard on the car. Sheets with the symbol printed on them are kept on hand, and the blank space is filled with any wording desired. Any special occasion in either of the terminal towns or at points along the line is announced on these sheets. Special theatrical performances, automobile races, Labor Day celebrations and similar events are heralded in this manner. When the grand opera singer, Calve, was in Clinton, vigorous advertising of the fact in Davenport resulted in 104 people making the trip. At the performance of the violinist, Kubelik, sixty people from Davenport came over the line. Clinton people are in a similar manner induced to attend special theatrical performances in Davenport.

On the occasion of a circus in Clinton, the management of the road learned that the elephants would be bathed in the Mississippi River the Sunday afternoon preceding circus day. A little advertising of the fact resulted in several cars of Davenport people making the trip to view the unusual sight.

POSTER FOR WHICH PRIZE WAS GIVEN

At times the railway company has undertaken to inaugurate special days. On one occasion a "Tri-Cities Day" was inaugurated and created considerable traffic. When there are no special events to be advertised, the boards on the car carry some wording to suggest a pleasure ride over the line, as, for instance, in very hot weather the signs advise a cool ride as a relief.

Special time cards are printed of the ferries across the Mississippi River at Le Claire and Princeton. Ferry tickets are also sold on the trains and at the ticket offices of the railway company. No direct compensation is obtained, but the fact that a general knowledge of the existence of the ferries may cause traffic over the line is believed sufficient to warrant such actions. In addition, the good will of the ferry companies is gained, and this is considered of value. The same incentive is responsible for free advertising of Electric Park at Clinton, belonging to the Clinton Street Railway.

On one occasion the road offered a prize of $5 for the best cartoon to be used in advertising. One entitled "Come on in, the water's fine," was the winner of the prize and has since been used in advertising Mississippi Park when bathing facilities are provided. On another occasion mileage books good for 500 miles' travel on the line were offered to the persons in Davenport and in Clinton submitting the best verses to be used for advertising purposes and containing the words Clinton, Davenport and the symbol "I. & I." Five hundred and twenty-five verses were submitted. The verse winning the Clinton prize was:

If from Davenport to Clinton you've occasion to travel,
Don't study the problem, there's none to unravel.
In frosty December or blistering July,
Just take a nice ride on our own I. & I.

That winning the Davenport prize was:

The I. & I. we call for short
Our line from Clinton to Davenport.
With palace cars and well-built track,
We take you safely there and back.

The company has compiled a list of all the lodges, societies, churches and organizations of different kinds in the cities along the lines, and sends out periodically announcements of the fact that it is prepared to furnish cars for special trips and excursion or pinic parties. The announcements are often followed up by a representative of the company, who explains in detail what arrangements can be made for taking care of large parties.

CORRESPONDENCE

PROGRAM ADVERTISING

July 18, 1906.

Editors Street Railway Journal:

Within the last few months we have received quite a number of letters from railroad relief associations and the like, asking us to take space in magazines, programs, souvenir books, etc., and a number of solicitors have called upon us for advertising of this kind. We usually take an advertisement in these publications. It seems to me, however, that the principle of this practice is wrong and that the railway companies that permit such to be carried on are countenancing what is little less than blackmail. At all events, it is pretty small business to ask outsiders to contribute to funds for the support of disabled employees. Some of these letters and requests have included something like the following, which I quote from a letter of an association of street railway employees which is one of the largest in the country: "We trust you will favor use with your advertisement, and we will reciprocate on all occasions." Some of the solicitors strenuously insist that an advertising value is given on account of large free distribution of their publications, but as a rule they have little to say about that. In one letter recently received is the following: "There is no regular price for advertising; we have received from $5 to $50 for ads." In this letter it is requested that checks be made payable to the treasurer of the association, who is also one of the chief officers of the railway company. It has occurred to me that the matter might appropriately be referred to in the Street Railway Journal.

Manufacturer.

ARMATURE WINDING AGAIN

July 20, 1906.

Editors Street Railway Journal:

Since writing you the letter which appeared in your issue of April 7 I have had an opportunity of seeing how some other street railway companies handle their work in the armature room. Our master mechanic recently made an arrangement to help out a street railway company in a neighboring city by rewinding their armatures, as they were very much behind in their work. In return they helped us with our overhead work. When we arrived at their shops we found plenty to do. About 100 armatures were out of commission, and nearly all were to be rewound. The company had the coils necessary, but no new mica segments. Some segments which they intended to use were burned ¼ in. deep, and we found that it had been their practice to use old burned segments, scraped and filled with a compound. Even the bead rings on the 800's were not taken off, although the mica was burned through to the composition ring.

Instead of using the original babbit liner, they were accustomed to put a sleeve on the shaft to reduce the weight of brass necessary in a brass liner which the company made and is now using. Before any repairs can be done to the commutator, it is necessary to cut off this sleeve to get off the thrust collar, then the screws and commutator shell—hence the reason commutator work was neglected. We found one armature winder and about six boys at work, but making no headway.

The shops of the company of which I write were described in the Street Railway Journal some months ago, and the illustrations were very elaborate, but the winding room is so insignificant (only 60 ft. x 30 ft.) that no view of it was published.

Now, Mr. Editor, every master mechanic knows that armatures constitute his chief trouble, and his main object should be to have the armature leave the winding room in the best possible condition and repaired with the best material.

When I had rewound the first armature for them, it was turned over to a lathe hand, who did not understand the work required on it. He turned the commutator and hooded the armature, but the next day it was returned to the winding room, with a shorted coil. On cutting away the string band I found that none of the surplus solder had been turned off before hooding. When the lathe hand was reprimanded for his negligence, he said that he did not have time to turn it off, but thought it would melt off when it got hot.

We have also been doing armature repairs for three other street railway companies in neighboring towns who can not afford to keep a repair man for the small amount of work which they have. A short time ago an armature arrived from these companies, rewound by some person who did not have the least idea of what he had to do, as the result will show. The coils on this armature span 1 and 15, and are connected 1 and 55. There is also one coil cut dead in connecting. The winder wound the machine 1 and 13 and connected 1 and 47. When he found that he had one lead too many in the first layer of leads, he cut that lead off. He then commenced laying his second layer at any point, and when he found he had a lead too many in that layer he cut that one off! That armature winder was probably paid $2 per day; it took him four days on the armature, and the company lost $27 in coils.

Armature Winder.

EQUIPMENT FOR THE INDIANAPOLIS, NEW CASTLE & TOLEDO ELECTRIC RAILWAY

The State of Indiana, already netted with interesting systems of interurban railways, will soon have added to those now in successful operation a new line of electric railway between Indianapolis and New Castle, Ind., as the main terminals, with branch lines to Greenfield, Anderson, Muncie, Winchester and Richmond, the total mileage of which is 140. A private right of way 50 ft. wide, and terminal facilities controlled by the company in the City of Indianapolis, place the new system in a very favorable position for maintaining high speed through the country, and secure rapidity of entrance and exit from the city proper. In addition to the passenger traffic, the company's franchise permits the transportation of freight without any restriction.

The engineering features of the road include a main power station near New Castle and ten permanent and one portable sub-station, one sub-station being installed in the main power-plant building. A transmission voltage of 33,000 volts was adopted, not only to meet the engineering requirements of the present system, but also because the voltage at the frequency selected would enable the system to mesh properly with practically all of the other similar systems now operating in Indiana, should future conditions so demand. Seventy-pound A. S. C. E. section T-rails, heavily ballasted, will permit of high-speed train operation.

The schedule so far prepared contemplates hourly runs between Indianapolis and Richmond, with connections for branch roads laid out to provide the most thoroughly satisfactory service. Limited high-speed service will also be established between Indianapolis and Richmond, operating on three-hour headway and making proper connections with branch roads. An express service is allowed for as well, and two 50-ton electric locomotives will be provided for freight haulage and switching purposes.

The contract for the entire construction of buildings and roadbed has been awarded to the Electrical Installation Company, of Chicago. Complete Allis-Chalmers power and electrical equipment will be installed in the main power station, and three rotary converter sub-stations will be built at once, the building of the remaining sub-stations being delayed until later. The equipment for the main power station will, for the present, consist of two 1000-kw turbo-generators to operate at 175 lbs. steam pressure and 50 deg. F. superheat, the electrical ends of these units being wound for 25 cycles, three-phase, 2300 volts.

The boiler equipment will be made up of three horizontal water-tube boilers, 175 lbs. gage, with normal rated capacity of 400 boiler horse-power each, and fitted complete with mechanical stoking devices. Two boiler feed pumps are provided, each of sufficient capacity to handle the total amount of feed water necessary for operation of six 400-hp boilers at their normal rated capacity. The feed pumps are to be of the horizontal outside, center-packed plunger type. A feed-water heater of the open cast-iron type will be provided, capable of handling 45,000 lbs. of water per hour.

Two complete surface condenser equipments will be furnished, consisting of condenser proper, steam-driven air pump and centrifugal circulating pump, direct connected to a single engine, each outfit capable of condensing 20,000 lbs. of exhaust steam per hour. Two exciter generators will be furnished, one for each of the 1000-kw turbo-alternators. Six 350-kw oil-filled, water-cooled, step-down transformers for a ratio of 2300 to 33,000 volts are provided. They are to be arranged in two banks of three each for connection to the alternators. Three converter transformers, each 150-kw, oil-filled, self-cooled, step-down type for 33,000 to 405 volts will be provided for supplying current to the 400-kw compound wound rotary converter to be installed in the main power plant, 400 kw, 25 cycles, 405 volts a. c., 650 volts d. c. A 40-kw, 120-volt, direct-current generator, provided for direct-connection to a high-speed engine, will be so connected as to form a reserve for either one of the two direct-connected exciters specified, so that in case of the breakdown of either one the corresponding alternator will not be disabled. This generator will also furnish the station lighting. The outside sub-stations will each be provided with a 400-kw, 25-cycle, three-phase rotary converter and three 150-kw, oil-filled, self-cooled transformers, similar to those already described.

Eight complete car equipments will be provided, each consisting of four 75-hp railway motors, two controllers, Christenson air-brakes, one set of rheostats, and miscellaneous apparatus.

The controllers which have been developed for use with these motors are made suitable for two and four-motor equipments. They are of the series parallel type, and are provided with an efficient magnetic blow-out.

MALLEABLE IRON ANCHOR

While there are many anchors on the market, the W. G. Nagel Company, of Toledo, claims that none has been able to take the place entirely of the old-style "dead man." However, when this company designed its Hercules malleable iron anchors it felt assured that wherever the old style "dead man" could be used, the Hercules anchor could be installed at a less expense and do the work equally as well with a longer life.

MALLEABLE IRON ANCHOR

The plate proper of this anchor is made of high-grade malleable iron, the heavy center core being strengthened by braces, also having a reinforced crib around the edge of the plate to add additional strength. It is a well-known fact that malleable iron is the slowest to rust of any of the irons, and when buried it will last a lifetime. The plate, being of this material, cannot break under strains as is the case with cast iron. The rod of this anchor has a welded head of size sufficient to stand the breaking strain of the rod. Great care is taken in welding the eyes of the rods to prevent the chilling of the iron and weakening of the rod. When the anchor is properly set it pulls against earth which has not been disturbed or loosened by digging. Heavy rains, therefore, will not cause the anchor to creep by washing the earth back of the anchor plate or pack loosened earth ahead of the anchor.

The statement has been made that by June 1 the gross earnings of the Columbus Railways & Light Company will reach such a sum as would compel it to sell eight tickets for a quarter. The franchise provides that when the earnings reach $1,750,000 the company shall do this. Last year the railway earnings were $1,450,000. Probably not before 1908 will the required sum be reached. There is another phase which has not been entered in the account. The company is now operating the Central Market Street Railway, acquired from the Schoepf syndicate, and the earnings of this division will not count in the total. It is probable that the increase in the earnings of the Central Market Company will keep down the estimated increase on the other lines, and thus postpone the day of eight tickets for a quarter.

A NOVELTY IN CRANK MECHANISM FOR SINGLE-ACTING ENGINES

Radical departures in reciprocating engine design are very rare at present, as most if not all improvements for a long time have been in details. The Ramsey crank mechanism, however, introduces a new principle in engine construction. Although applicable only to single-acting engines, the increasing use of internal combustion engines opens up for it a wide field. In ordinary engine design the crank shaft is in line with the central axis of the cylinder and the connecting rod in most cases is approximately five times the length of the crank. To make the connecting rod shorter with the

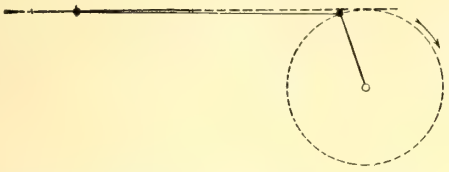


FIG. 1.—POSITION OF RAMSEY CRANK

ordinary crank mechanism introduces excessive cylinder friction because of the sharp angularity of the connecting rod during the power stroke. The Ramsey crank mechanism comprises a connecting rod made approximately three and three-eighths times the length of the crank, with the shaft located from the central axis of the cylinder a distance equal to the length of the crank. (See Fig. 1.) The first notable effect of the Ramsey crank mechanism is to increase the length of the piston stroke and to increase the proportion of the crank circle during which effective pressure is applied to the crank.

Thus in Fig. 2, AB and BC represent the positions of an ordinary connecting rod and crank at the beginning of the power stroke; DE and BC represent the positions of the same

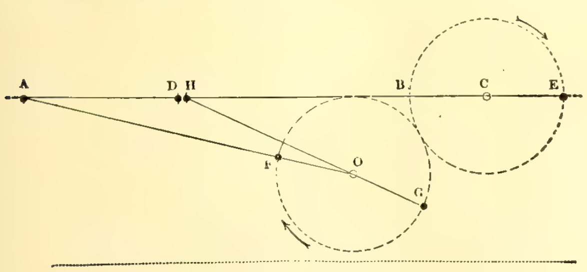


FIG. 2.—DIAGRAM OF PISTON TRAVEL

crank and connecting rod at the end of the power stroke. AD therefore represents the piston stroke, which is equal to the diameter of the crank circle. During this stroke the crank covers exactly one-half of its circle, or 180 deg. In the same figure AF and FO, illustrating the Ramsey crank mechanism, represent the positions of the connecting rod and crank at the beginning of the power stroke; and HG and GO represent the positions of the same connecting rod and crank at the end of the power stroke. AH therefore represents the piston stroke, which exceeds by about 5.25 per cent the diameter of the crank circle, while the crank pin has been driven from F to G, a distance which equals 192 deg. of the crank circle, or 12 deg. more than one-half the circle. The effect of the longer piston stroke is to increase the expansion of the gases, which not only increases the power to be obtained from an engine, but also the efficiency and economy with which it is operated. The gain in effective crank travel similarly increases the power that can be obtained from an engine of given dimensions.

Again, there is a decrease in the angularity of the connecting rod travel, and the greater the angularity—pressure and velocity considered—the greater will be the friction. With the ordinary crank mechanism the power stroke is made with an increasing angularity until the crank is at right angles to the piston rod, when the angle is about 12 degrees, whereas with the Ramsey crank mechanism the total angularity is much less, and at the center of the stroke is zero. Fig. 3 shows graphically the extent of piston travel with different degrees of angularity. In this figure the upper line represents the piston stroke of an engine equipped with the Ramsey crank mechanism. The lower line represents the piston stroke of an engine equipped with the ordinary crank mechanism, both engines having the same length of crank. The lines A and A', B and B', C and C', D and D', and so on up to and including L and L', represent the respective positions of the two pistons at intervals of 15 deg. of crank travel. M represents the position of the piston of the engine equipped with the Ramsey crank mechanism after 12 deg. of further crank travel, i. e., at the end of the power stroke. Above the lines, A, B, C, etc., are given the degrees of angularity existing between the connecting rod and the central axis of the cylinder of the engine equipped with the Ramsey crank mechanism when its piston is in these respective positions. Below the lines A', B', C', etc., are given the angularities existing between the connecting rod and the central axis of

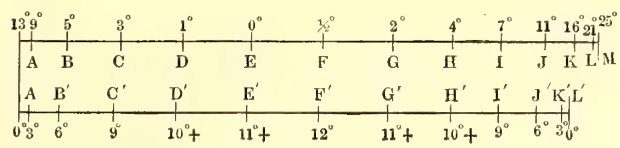


FIG. 3.—DIAGRAM SHOWING ANGULARITY OF STROKE

the cylinder of the engine equipped with the ordinary crank mechanism when its piston is in these respective positions. Reducing the relative travel of the two pistons to a percentage basis, the following percentages hold good for any length of crank:

	Ramsey Crank Mechanism	Ordinary Mechanism
During the power stroke the piston travels at less than a 10-deg. angle, is............	88%	50 %
At less than a 9-deg. angle.....	85%	30 %
At less than a 6-deg. angle.....	73%	13¼%
At less than a 3-deg. angle.....	50%	3¼%
At less than a 1-deg. angle.....	31%	1¼%

Another advantage claimed for the new mechanism is the sluggish movement imparted to the piston at the beginning of the return stroke. The position of the connecting rod is such at this point that the crank travels through a wide arc while the movement of the piston is slight. This can be understood by referring back to Fig. 2. This peculiar quality makes it possible to exhaust the burnt gases with considerable less back pressure than that which is inevitable in an ordinary engine. In the case of a two-cycle engine the sluggish movement presents a further advantage, in that less of the power stroke need be sacrificed by the opening of the exhaust port, thus enabling the engine to be run at a higher speed. After the piston passes the point of its sluggish movement it returns to the inner end of its stroke very rapidly. This minimizes the loss of heat by radiation during compression, and thus increases the temperature and pressure in the cylinder at the time of ignition, correspondingly increasing the initial pressure of the power stroke.

For the purpose of determining to what extent the Ramsey

crank mechanism will improve the efficiency, an engine was constructed and equipped with the Ramsey crank mechanism on the lines of a well-known vertical marine gasoline engine having a 9½-in. x 14-in. cylinder. The manufacturers claim for their engine a fuel consumption of one-eighth of a gallon of gasoline per horse-power hour, while in the tests made of the engine equipped with the Ramsey crank mechanism the fuel consumption was found to be from 1-10 to 1-11 of a gallon per horse-power hour. This engine, working under brake loads varying from 22 to 30 hp, showed a total heat efficiency of the engine ranging from 24.1 per cent to 25.9 per cent, as compared with approximately 19 per cent for the engine equipped with the ordinary crank mechanism after which the test engine was patterned. It is thought, however, that the efficiency will be still further increased with the new mechanism in an engine improved by changes in the design rendered possible by the crank mechanism. In other words, the advantages of the increased expansion, the greater piston stroke and crank effort, the decreased friction, the sluggish movement and quick compression, etc., will materially benefit the efficiency of any engine without regard to the excellency of its other features.

The mechanism is the invention of Robert H. Ramsey, of Philadelphia, and is controlled by the Ramsey Engine Company, of that city, which proposes to issue licenses to manufacturers of single-acting engines in this country.

NEW ROLLING STOCK FOR PADUCAH TRACTION COMPANY

The American Car Company, of St. Louis, has just completed a number of cars embodying the Brill grooveless post, semi-convertible window system for the Paducah Traction Company of Paducah, Ky. This company operates, in addition to the new equipment, seventeen motor and twelve trailer cars, both single and double-truck, equipped with motors of 25-hp capacity each. Twelve miles of single track are operated, covering the principal parts of the city. Wallace Park, consisting of 75 acres at the end of the Broadway line, is controlled by the traction company; there are no public parks in the city at present. An extension of the lines into Mechanicsburg, a district of Paducah to the south of Island Creek with a population of about 4000, is contemplated, which will add about 1½ miles of track to the company's present system. The entire track and overhead system is being rebuilt this summer, and in the near future a new power station and car house will be erected, and it is expected that in a short while additional cars will be needed to take care of the rapidly increasing business. Power for the Paducah Traction Company bought from the Light & Power Company of Paducah, which, like the traction company, is operated and managed by Stone & Webster, of Boston.

SEMI-CONVERTIBLE CAR FOR THE PADUCAH TRACTION COMPANY

The dimensions of the new cars are as follows: Length over the end panels, 28 feet, and over the vestibules 38 ft.; width over the sills, including the sheathing, 8 ft. 3½ ins.; width over the posts at the belt, 8 ft. 6 ins.; sweep of the posts, 1¾ ins.; centers of the posts, 2 ft. 8 ins.; height from the floor to the ceiling, 8 ft. 5 11-16 ins.; height from the track to the under side of the sills, 2 ft. 8⅝ ins.; height from the track to the platform step, 1 ft. 4 15-16 ins.; size of the side sills, 4 ins. x 7¾ ins.; size of the center crossings, 4½ ins. x 5½ ins.; size of the end sills, 5¼ ins. x 6⅞ ins.; size of the inside sill plates, ⅜ in. x 12 ins.; thickness of the corner posts, 3¾ ins.; thickness of the side posts, 3¼ ins. On entering the car the passenger reads in bold, black letters this sign: "Notice to Passengers: No disorderly or otherwise objectionable person, whether or not under the influence of liquor, will be permitted to ride on this car. Passengers riding on platform do so at their own risk." There are two such signs at each end of the car, painted on the glass on each side of the center vestibule sash.

The seats are of Brill manufacture, 36 ins. in length, permitting an aisle space of 26 ins. Numerous specialties are employed throughout the car, among them being the "Dedenda" alarm gong, "Dumpit" sand box, "Retriever" signal bell, angle-iron bumper, etc. The car body is mounted on No. 27-GE1 trucks having a wheel base of 4 ft. 6 ins. and wheel diameter of 33 ins., the diameter of the axles being 4½ ins. Two 40-hp motors are used per car. The weight of a car and trucks without motors is 24,000 lbs.

SUBWAY PROPOSED FOR SAN FRANCISCO

With the purpose of taking advantage of the present opportune time in San Francisco, Reed & Co., of 44 Market Street, have presented a plan to the Board of Supervisors for a subway under Market Street, from Third Street to the ferry. Such a construction would leave the street level free for a boulevard, and thus relieve the congestion on lower Market. The proposed plans include loops at the ferry with a special dome-covered depot and ornamental stairway, stations, etc., on the line of the subway.

ELECTRIC INTERURBAN CAPTURES BIG EXCURSION

E. V. McGrath, soliciting passenger agent of the Indiana, Columbus & Eastern Traction Company, has contracted to handle the annual picnic of the National Cash Register Company, from Dayton to Tecumseh Park. This excursion annually brings out 10,000 people, and no traction line has ever attempted to handle it heretofore. The new management of the former Appleyard lines is going after the long-distance and special excursion business on an extensive scale.

The electrification of the Para tramways, of Para, Brazil, is being carried out by J. G. White & Co., Ltd., of London, and not by the J. G. White Company, of New York, as mentioned in a recent issue of this paper.

LEGAL DEPARTMENT*

CONTIGENT FEES AND ATTORNEYS' LIENS

It has been the law from time immemorial that an attorney is entitled to a lien upon a judgment obtained for his client for compensation for legal services. The tendency of modern times has been to extend rather than curtail the attorney's rights by statute. In New York, for example, it is expressly provided that the compensation of a lawyer for his services "is governed by agreement, express or implied, which is not restrained by law," and that "from the commencement of an action or special proceeding, or the service of an answer containing a counterclaim, the attorney who appears for a party has a lien upon his client's cause of action, claim or counterclaim, which attaches to a verdict, report, decision, judgment or final order in his client's favor, and the proceeds thereof in whosoever's hands they may come; and the lien cannot be affected by any settlement between the parties before or after judgment or final order." Interpreting this provision, the New York Court of Appeals (Fischer-Hansen vs. B. H. R. R. Co., 173 N. Y., 492) held that where a claim and cause of action are extinguished by a settlement made by the parties before judgment, the implied, although not express, effect of the statute is that an attorney's lien extends to the proceeds. It attaches to the fund the instant it is created by the settlement, so that a party who with actual or constructive notice of the lien pays the fund over to the other, does so at his peril, and is liable to the attorney for the amount of his lien in an equitable action to enforce it, if he is unable to collect it from his client on account of the latter's financial irresponsibility. It is positively laid down that the existence of the attorney's lien does not prevent an honest settlement in good faith between the plaintiff and the defendant.

It has always been the policy of the law to encourage the settlement of litigation, and an attorney may not prevent a compromise if his client be satisfied with the amount tendered, the attorney's lien, however, being preserved upon the amount of the actual settlement.

There has recently been something of a judicial controversy over the question how large a share or proportion of a client's prospective recovery an attorney may legally contract to receive. The Appellate Division of the New York Supreme Court, First Department, in Matter of Fitzsimons (77 App. Div., 345), held that an agreement by which a lawyer was to take as his compensation one-half of his client's interest in what was stated to be a large estate was upon its face unconscionable. Two decisions of the Federal Courts (Herman vs. Met. Street Ry., 121 Fed. 184, and Muller vs. Kelly, 125 Fed. 213) have taken the same position that a 50 per cent contingent fee was to be regarded as unconscionable and therefore unenforcible. The New York Court of Appeals, however, on appeal in the Fitzsimmons case (174 N. Y. 15) refused to endorse the theory that an agreement for a 50 per cent contingent fee is unconscionable necessarily, or as a matter of law. It was held that, as the right of attorney and client to contract is express and unlimited, an arrangement for any percentage, no matter how large, is not void on its face, but the question of unconscionability is one of fact to be determined after a consideration of amount involved, work required, and other features of the particular case.

The most recent utterance of the New York Court of Appeals on this subject is of considerable interest to street railway corporations, that are constantly called upon to consider the settlement of claims for damages for personal injuries. In Morehouse vs. Brooklyn Heights Railroad Company (New York Law Journal, July 10, 1906) it was held that a railroad company which has made an honest settlement with the plaintiff in an accident case and paid to him the full amount, although it had received timely notice that his attorney had a lien for 50 per cent of any sum paid on compromise of the case, may defend an action subsequently brought by the attorney to recover one-half the amount paid, on the ground that the attorney's contract with his client was unconscionable, and therefore void. The Court takes the position that, as the client is primarily liable to pay over to the attorney the latter's share of the sum received in settlement, if the client does not do so the defendant is in the position of a surety for the client to the attorney, and is therefore subrogated to any defense the client might interpose. This position is sound enough legally, and the result is certainly just. It is hardly the part of wisdom to pay over large sums in settlement without seeing to it that attorneys' liens are satisfied, but the present decision enables a defendant, where that has been done, to raise the same defense which the client might have made to the rapacity of an ambulance-chaser.

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CHARTERS, ORDINANCES, FRANCHISES.

KANSAS.—Railways—Railway Commissioners — Jurisdiction—Electric Roads—Crossing Other Roads—Electric Railways—Railway Commissioners.

1. In giving the board of railway commissioners supervision over railways operated by steam, the statute, by implication, denies them power over railways operated only by electricity.

2. In defining the term "railway company" as used in the railway commissioners' law to mean a company whose road is operated by steam, the statute forbids such term being construed to include a company owning a road operated only by electricity, except where such intention may be expressly manifested.

3. The section of the statute which gives the board of railway commissioners authority to hear and determine the application of a railway company for permission to cross its track "with any other railway upon the grounds of such other railway corporation" does not apply to a case where a railway company seeks to cross the track of a railway company whose line is operated entirely by electricity.

4. A line of railway which is so constructed as to be operated only by electricity, and which is, in fact, so operated, is not a railway operated by steam, within the meaning of the railway commissioners' law, even although it is owned and managed by a corporation whose charter permits the use of steam as a motive power.

5. The board of railway commissioners has no jurisdiction to entertain an application by a railway company for leave to cross its track with that of a railway company using only electricity as a motive power.—(Kansas City, O. B. & Electric R. Co. vs. Board of Railway Com'rs et al., 84 Pac Rep., 755.)

MASSACHUSETTS.—Eminent Domain—Damages—Evidence—Competency—Mortgage Value—Evidence—Opinions — Reasons—Damages From Elevated Railway.

1. Even if it be competent to show diminution, in the mortgage value of property, as evidence of diminution in its market value, which is the measure of damages to abutting property from construction and maintenance of an elevated railway in the street, evidence that persons applied to were unwilling to loan on a mortgage on the property the amount which had been loaned on it is not competent for such purpose.

2. In the absence of evidence that there is a market for mortgages, in which the same percentage of market value can be borrowed on all properties, evidence of diminution in mortgage value is not competent to show diminution in market value, which is the measure of damages to abutting property from construction and maintenance of an elevated railway in a street.

3. Evidence of matters incompetent as substantive evidence may not be introduced to fortify the opinion of an expert, though offered under the guise of reasons for his opinion, and though they might be introduced on his cross-examination to test and diminish the weight to be given his opinion.

4. In proceedings to recover damages to abutting property from construction and operation of an elevated railway in the street, testimony of the keeper of the restaurant on the premises that on several occasions people who came there went out, saying: "We can't talk here. Let us get out of here, and eat somewhere where we can talk and hear ourselves"—is admissible as showing the effect of the noise of the railway.—(Pierson vs. Boston Elevated Ry. Co. New England Trust Co. vs. same, 71 N. E. Rep., 769.)

MASSACHUSETTS.—Eminent Domain—Damages—Injuries to Property—Evidence.

1. In proceedings for the assessment of damages to land and buildings caused by the construction and operation of an elevated railway, the court did not abuse its discretion in admitting proof of the rents received from the property for several years prior to the assessment, in the ordinary course of business, under normal conditions, and in good faith.

2. Neither was the admission of proof of the cost of a building on the land erroneous, where there was nothing to show that the sum paid was not paid in good faith and under normal conditions.—(Levenson et al. vs. Boston Elevated Ry. Co., 77 N. E. Rep., 635.)

MASSACHUSETTS.—Duplication of Questions—Evidence—Matters of Opinion on Fact—Eminent Domain—Construction of Street Railways—Damage to Adjacent Property—Evidence—Trial—Exhibits—Inspection Through Microscope—Elements of Damage—Injury to Health—Witness—Impeachment.

1. In a suit for damages to a building used in part for stores by the maintenance of an elevated railway in the street, a witness testified that when passengers were carried on surface cars on the street there was an opportunity for merchants to display goods, and that customers frequently stopped along the street and made purchases, while the elevated road carried passengers past the portion of the street where plaintiff's property was situated without a stop. Held, that this testimony did not justify the exclusion, as mere reiteration, of a further question as to what witness would say of the street as a business street before the erection of the elevated structure.

2. In a suit for damages to a building by the maintenance of an elevated railway in the street, a question as to what were the witness' observation as to the conditions of travel on the street since the erection of the elevated structure did not call for the opinion of the witness as an expert, but related to a question of fact.

3. In a suit for damages to a building by the maintenance of an elevated railway in the street, it was within the discretion of the court to admit or exclude a question as to what would have been a fair price for the use of a part of the building before the elevated structure was erected.

4. In a suit for damages to a building by the maintenance of an elevated railway in the street, it was within the discretion of the court to refuse to allow the jury to inspect through a microscope particles of steel and iron collected from the building with a magnet.

5. In a suit for damages to a building by the maintenance of an elevated railway in the street, plaintiff was entitled to introduce evidence that the inhalation of particles of steel and iron, which floated into the building because of the operation of the road, were apt to cause pulmonary affections and injure the general health of occupants of the building.

6. In a suit for damages to a building by the maintenance of an elevated railway in the street, in which plaintiff had testified that the value of the property after the erection of defendant's structure was from $7,800 to $10,000, evidence that plaintiff employed agents to sell the property and named $17,000 as the price was admissible.—(Cotton vs. Boston Elevated Ry., 77 N. E. Rep., 698.)

MICHIGAN.—Street Railways—Train Railway—Use of Streets—Ordinances—Authority Under Train Railway Act—Additional Feed Wires in Street.

1. The grant by a city to a company organized under the train railway act, of the right to construct and operate a street railway with all necessary tracks and connections, all tracks to be constructed under the supervision and with the approval of the Common Council, does not authorize the company to make a connection in the streets of the city with the tracks of a company organized and operating under the general railway laws, and having no franchise from the city, though in the ordinances granting franchises to such train railway company, and to another company organized under the general railway laws, a connection between them, and transfers from the one to the other, were required.

2. Train Railway Act Section 41, providing that companies organized under such act may make connection with any other railway, and that when the road of such a company is intersected by any new road it shall unite with such road in making a connection, and grant running and business facilities, does not authorize such a company to make connection, when, where and how it may, in the streets of a city, with the road of a company organized under the general railway act, the preceding sections of the act allowing construction of a railway in the streets of a city only with the consent of, and subject to the conditions imposed by, the city authorities.

3. Under the provisions of the ordinance granting a train railway company the right to construct and operate a street railway, that "no wires carrying an electric current shall be placed in said street except the trolley wire," the company may not, without further authority, place in the street an additional feed wire, not a trolley wire. (City of Monroe vs. Detroit, M. & T. Short Line R. Co. et al., 106 N. W. Rep., 704.)

MISSISSIPPI.—Carriers—Ejection of Passenger—Violation of Law Requiring Separation of Races—Evidence—Admissibility—Defense—Compliance with Law by Carrier—Street Railways.

1. In an action against a street railway company for ejecting a passenger and causing him to be arrested for violation of Laws 1904, p. 140, c. 99, relating to the division of cars into separate compartments for the white and colored races, where the only evidence of a division of the inside of a car between the two races consisted of proof of an established custom, testimony to establish a custom of the company to permit passengers of both races to occupy the back platform of its cars was admissible.

2. To justify a street railway company in causing the arrest and ejection from its cars of a passenger for a violation of Laws 1904, p. 140, c. 99, providing that street railways shall provide separate accommodations for the white and colored races by providing two or more cars, or by dividing the cars by a partition or adjustable screen, the company itself must have complied with the provisions of the law.

3. The posting of a sign in a street car indicating that a part of the car was to be used by white persons and another part by colored persons was not a sufficient compliance with Laws 1904, p. 140, c. 99, providing that street railways shall provide separate accommodations for the white and colored races by providing two or more cars, or by dividing the cars by a partition or adjustable screen, especially where the sign posted was not large enough to be seen in all parts of the car. (Waldauer vs. Vicksburg Ry. & Light Co., 40 S. Rep., 751.)

MISSISSIPPI.—Corporations—Contract with Promoters—Construction—Liability of Corporation—Disposition of Assets—Right to Object—Stockholders—Promoters' Contract—Construction—Sale of Franchise and Assets—Insolvency—Corporations — Judgment — Assignment — Equitable Relief — Prayer.

1. Plaintiff and his associates acquired a franchise for the construction of a street railway, which he contracted with S. and others to transfer to a corporation in consideration of their agreeing to build the railroad and pay to plaintiff and his associates 25 per cent. of any profits that might be made out of the property, either in cash, bonds or stock. In a letter written by S. to plaintiff, he stated that the mortgage bonds of the company, amounting to $200,000, would be sold, and all the money put into the plant, without profit, and that S. and his associates were not to make any profit out of the construction of the road. None of the stock or bonds of the company were ever disposed of, except $100,000 of stock and $50,000 first mortgage bonds. Held, that the amount advanced by S. and his associates for the construction and equipment of the road should not be treated as a payment on capital stock, but as a first lien on the railway and its franchise in determining the amount of plaintiff's interest in the corporation.

2. Where, at the time a street railway franchise was assigned to S., it was understood that it was being acquired for the benefit of a corporation which was to own and operate the road, which corporation had already been chartered, and the corporation subsequently accepted the benefits accruing to it from the contract and availed itself of the franchise, with full knowledge of the manner and conditions on which it was obtained, a contract by the promoters to pay plaintiff 25 per cent. of the profits in stock, bonds, etc., in consideration for his services in obtaining the franchise, was binding on the corporation.

3. The entire scheme for the construction of a street railway, and the corporation organized to exploit the same, was projected without any attempt to comply with the law against issuing stock or bonds, except for money, labor done, or property actually received. No money was ever paid in on the capital stock, and no property of value, except the franchise and the plant and franchise of an electric company, was ever transferred for which stock could legally have been issued. The stock and bonds, except those issued to pay for the electric plant, were never disposed of by any corporate act. Held, that the individual incorporators could not object, in a suit by one of the promoters to enjoin an alleged fraudulent sale of all of the corporation's assets, fran-

chise and property, that plaintiff was not entitled to sue, because no stock had ever been issued to him in settlement of his contract, by which he was to receive one-fourth of the profits of the transaction.

4. Where the incorporators of a street railway company agreed, in consideration of the assignment of a franchise procured by plaintiff to one of them for the benefit of the company, to pay plaintiff one-fourth of the stock and bonds of the corporation over and above the cost of construction, plaintiff's right was not to receive a definite number of shares of stock, but the equitable ownership of one-fourth of the whole railway when completed and equipped, together with its franchise, subject to a prior lien in favor of the incorporators advancing the money to complete and equip the road to the extent of the money so advanced.

5. Plaintiff and his associates obtained a street railway franchise, which was assigned to S., to be later transferred to a corporation, under a contract by which plaintiff became the equitable owner of one-fourth of the whole road, subject to a lien for the amount necessary to construct and equip the same. The corporation was organized, plaintiff being recognized as a stockholder, and he was elected secretary without any stock being issued to him; the whole authorized capital being issued in blank and put in possession of S. as president, and the corporation being operated by dummy directors, voting as directors and stockholders by virtue of certificates issued in their names by S. Held, that a subsequent sale of all the corporation's assets, franchise, etc., to a third person, authorized at a secret meeting, of which plaintiff was purposely not informed, for the purpose of nullifying his interest, was fraudulent and void, though the corporation was insolvent at the time.

6. Where a contract for the construction of a street railway contemplated that the moneys advanced to complete and equip the railway should be treated as a bonded debt, and not as a current debt presently payable, the current revenues derived from the operation of the road could not be diverted from the payment of operating expenses, fixed charges, and current expenses, and applied to such construction debt for the purpose of showing that the road was insolvent.

7. Where an assignment of certain judgments against a street railway company, the property of which had been purchased by J. under a fraudulent sale, was brought about by him in order that he might buy the assets of the railway company at an execution sale and strengthen his title, neither J. nor a new corporation formed to take over and operate the road could avail themselves of any rights acquired under such judgments against the original corporation.

8. Where defendants, including a new corporation organized to take over the assets of a street railway, participated in a sale thereof which was fraudulent as against plaintiff, but prior to the institution of a suit to set aside the same defendant J. and the new corporation paid debts and judgments existing against the old corporation, and a vacation of the sale and the appointment of a receiver would probably seriously affect the public interest, a personal decree would be rendered instead against both the old and the new corporations and the individual defendants for the amount of plaintiff's interest, of which he was so deprived, under his prayer for general relief.—(Mulvihill vs. Vicksburg Ry., Power & Mfg. Co. et al., 40 South Rep., 647.)

MISSOURI.—Carriers—Carriage of Passengers—Carrier's Duty —Ejection of Passenger—Force Justified—Rules—Conduct of Passenger—Reasonableness of Rule—Prohibition of Smoking—Continuous Assault—Procuring Passenger's Arrest—Excessive Force—Action—Instructions.

1. The duty of a carrier to exercise the highest degree of care to protect a passenger from assaults, whether offered by strangers or by the carrier's servants, continues until the passenger has left the vehicle in safety at his destination.

2. If it becomes necessary to eject a passenger because of his misconduct, no more force must be employed than is required to accomplish the removal.

3. A passenger is bound to observe and obey reasonable rules established for the convenience and comfort of other passengers, and, on his failure so to do, his ejection is warranted.

4. A prohibition of smoking in a street car is a reasonable rule.

5. Where a conductor in attempting to eject a passenger used excessive force, and assaulted the passenger, and followed him from the car, and ran after him, and, overtaking him, again assaulted him, there was a continuous assault, all of which was included within the exercise of excessive violence in the ejection.

6. A carrier was liable for a conductor's assault on a passenger, who had been ejected from the car, the assault being incident to an effort to procure the passenger's arrest.

7. Where, in an action against a carrier, the petition charged that defendant's servants assaulted plaintiff, drove him from the car, and knocked him down upon the streets of the city, and there was evidence tending to show that the first assault committed by the conductor was all over when the plaintiff left the car, and that it was several minutes before the conductor started to look for an officer and as incident to such search committed another assault, it was error to instruct the jury in effect that they might find for plaintiff, either under the hypothesis that the assault was continuous, or that two separate assaults were made. (McQuerry vs. Metropolitan St. Ry. Co., 92 S. W. Rep., 912.)

NEW YORK.—Carriers—Regulation—Passengers—Transfers—Refusal by Conductors—Penalty.

Laws 1890, p. 1114, c. 565, Section 105, providing that railways operating intersecting lines shall give to each passenger paying a single fare a transfer, entitling such passenger to one continuous trip to any portion of its road, "to the end that public convenience may be promoted by the operation of the railways embraced in such contract, substantially as a single railway with a single rate fare," and providing a penalty for failure to give such transfer, does not render a company liable to the penalty where it has established a system of transfers for its intersecting lines, and furnishes its conductors with tickets for that purpose, and some individual passenger has not received transfers through the misjudgment, neglect, or mistake of the conductor.—(Schwartzman et al. vs. Brooklyn Heights R. Co., 98 N. Y. Sup., 941.)

NEW YORK.—Street Railways—Construction in Street—Consent—Value of Property.

Under Railway Law, Heydecker's Gen. Laws, p. 3308, c. 39, Section 91, providing that a street surface railway shall not be built without the consent of one-half in value of the property "bounded on" that portion of the street on which it is proposed to build the railroad, the value of an entire tract abutting on the street, with buildings thereon, is to be considered, though it extends back to another street; it having no interior boundaries, natural or artificial, and being used as an entirety for a single purpose.—(Fox et al. vs. New York City Interborough Ry. Co., 98 N. Y. Sup., 338.)

NEW YORK.—Easements—Conveyance of Dominant Estate—Reservation—Effect of Reservation—Action for Injuries to—Conveyance Pending Action—Creation of Trust.

1. On conveyance of a dominant estate, easements of light, air and access, abutting on a public street, pass to the grantee, notwithstanding attempted reservation of the same in the deed and of any rights of action for their injury.

2. Where easements of light, air and access, together with rights of action for their injury, are reserved in a deed, though such reservation is ineffectual to create a trust therein, it makes the grantee the trustee of money received or judgments recovered for any injury to such easements.

3. Where, in a conveyance of land, the grantor attempts to reserve the easements of light, air, and access, and any right of action for injuries thereto, and such easements have been destroyed, the grantee is the only person who can sue for the damages thus caused, or can execute a release in satisfaction thereof.

4. An abutting owner of property brought an action for damages by the operation of an elevated road, and thereafter conveyed the property pending the suit, reserving his right of action and easements of light, air and access. Thereafter the railway company obtained from his grantee, with knowledge of such reservation, a release of the easements and any right of action therefor, paying an agreed sum. The grantor thereafter sued the railway company and his grantee to have the grantee declared a trustee for his benefit, and asking that the release be set aside. Held, that a judgment of the trial court dismissing the complaint as to the company was proper, as the reservation in the deed created no equitable lien on such easements apart from the freehold to which they were appurtenant, but only created an equitable lien in favor of the grantor on the moneys received as against his grantee.—(McKenna vs. Brooklyn Union Elevated R. Co. et al., 77 N. W. Rep., 615.)

NEW YORK.—Carriers—Rates of Fare—Overcharge—Recovery of Penalty—Street Railways—Mistake of Law.

1. Laws 1890, p. 1095, c. 565, Sec. 37, as amended by Laws 1892, p. 1392, c. 676, provide for a penalty for the exacting by a carrier of unlawful rates of fare, unless the overcharge was made through inadvertance or mistake, not amounting to gross negligence. Held, that where a railway made a mistake in the construction of its statutory rights, such as an ordinary prudent person, honestly desiring to act within his rights, might make, it is exempt from the penalty.

2. Where a street railway company had on its route an elevation exceeding 300 ft. to the mile, which it overcame within a distance of two miles, it is not liable for the penalty imposed by Laws 1890, p. 1096, c. 565, Section 39, for charging a fare of ten cents for a continuous ride over its road, where under a mistake of law it construed the statute authorizing a railway to collect such a rate of fare under such circumstances as comprehending within its operation a street railway corporation, as Section 39, if applied to a street railway, will include within its exemption from the penalty cases of mistake in law, as well as mistake in fact.—(Goodspeed vs. Ithaca St. Ry. Co., 77 N. E. Rep., 392.)

OHIO.—Street Railway—Franchise—Extension of Term—Municipal Extension of Term—Validity.

1. An intention to prolong the life of a street railway franchise from the date originally fixed for its termination to February 10, 1908, which was the date fixed for the expiration of a franchise granted to another company with which the company operating the former franchise was, with the consent of the city, consolidated, must be inferred from subsequent ordinances authorizing the consolidated company to extend its lines and change to electricity as a motive power, the rights under all of which were to terminate with the franchise of the "main line," which was recognized as continuing until that date.

2. Municipal ordinances extending the life of a street railway franchise from the date originally fixed for its termination to the date fixed for the expiration of a franchise granted to another company with which the company operating the former franchise was, with the consent of the city, consolidated, do not violate the provisions of Ohio Rev. Stat. Section 2502, that a municipal corporation shall not, during the term of a street railway grant or renewal thereof, release the grantee from any obligation or liability thereby imposed.

3. Municipal extensions of the life of a street railway franchise before the original grant has expired are authorized by Ohio Rev. Stat. Section 2501, although the language of that section is that the Council may renew any such grant at its expiration. (City of Cleveland and the Forest City Ry. Co., Appts. vs. Cleveland Electric Ry. Co., 26 Ct. Rep., 513.)

LIABILITY FOR NEGLIGENCE.

ILLINOIS.—Appeal—Review of Evidence—Peremptory Instruction—Decisions of Intermediate Courts—Trial—Theory of Case—Argument of Counsel—Carriers—Injuries to Passengers—Proximate Cause—Instructions—Prejudice—Trial—Remarks of Court—Witnesses—Leading Questions—Evidence—Hearsay—Harmless Error—Admission of Evidence—Carriers—Injuries to Passengers—Actions—Care Required.

1. Where no peremptory instruction was asked at the close of plaintiff's evidence, or at the close of all the evidence, the question whether the evidence fairly tended to support the verdict will not be reviewed on appeal.

2. In an action for injuries to a passenger, in the absence of a passenger, in the absence of a request for a peremptory instruction, the question whether defendant's employees were negligent, as charged in the declaration, was solely for the determination of the jury, whose finding, after having been affirmed by the Appellate Court, would not be disturbed on a further appeal to the Supreme Court.

3. Remarks of counsel in his closing argument to the jury will not control the theory on which the case is tried, when the pleadings, evidence, and instructions show that both parties proceeded on a different theory.

4. Where a passenger on a street car was injured in a collision between the car and a railroad train at a crossing, and the fault of the conductor of the street car in signaling to the motorman to cross when he knew a train was approaching contributed in part to the injury, the street car company was liable therefor.

5. Where a charge was given at defendant's request that if any witness had wilfully or knowingly sworn falsely to any material element of the case, or had exaggerated any fact or circumstance material to the issues to deceive, mislead, or impose on the jury, such witnesses' entire testimony might be rejected, except as corroborated by other evidence, etc., defendant was not injured by another instruction that it was only in cases where it was "palpable" that a witness had deliberately and intentionally sworn falsely and was not corroborated that the jury should disregard his entire testimony.

6. Where remarks by the court during the trial, amounting to strictures on counsel for defendant, were called forth by persistent attempts to get improper evidence before the jury, and the remarks were not of such a character as disclosed in any degree the court's views as to the merits of the case, or tended to show any views in favor of either party, and could not have been so understood by the jury, they were not reversible error.

7. A question asked of a witness with reference to a headlight on an engine: "That headlight—was that a regulation or another kind?" was objectionable, as leading.

8. Where a witness testified to facts showing that he did not see the engine in question or the headlight thereon, it was not reversible error for the court to strike his statement that the headlight was smaller than regulation size.

9. Where, in an action for injuries, evidence was admitted showing that the railroad train which ran into defendant's street car at the time plaintiff was injured while a passenger on the car was running at from 15 to 30 miles an hour, defendant was not prejudiced by the exclusion of evidence that the train was running faster than ordinary speed.

10. Where, in an action for injuries to a passenger on a street car by a collision with a railroad train at a crossing, the conductor, who went ahead and signaled the car to cross, testified that he saw the train when two blocks away, and did not realize there was any danger until it was within 100 ft. of the crossing, and fixed the location of the train at each of the periods he observed it, without basing his judgment in any way on its apparent speed, or any speed that he previously had knowledge of, a city ordinance regulating the rate of speed of trains at that point was immaterial.

11. An instruction rendering a carrier liable for injuries to a passenger caused by the "slightest negligence" was proper—(Chicago City Ry. Co. vs. Shaw, 77 N. E. Rep., 139.)

ILLINOIS.—Carriers—Injuries to Passengers—Actions—Instructions—Damages—Personal Injuries—Instructions.

1. Where a declaration against a street railroad for injuries to a passenger alleged that, while plaintiff was in the act of alighting from the car, defendant started the same before plaintiff had an opportunity to alight therefrom, a charge to find for defendant, if the preponderance of the evidence failed to show that plaintiff fell by reason of the car being started before she had an opportunity to alight therefrom, was properly refused, in that it failed to definitely state the issue presented by the pleadings.

2. In an action against a street railroad for injuries to a passenger, where the court charged that, if plaintiff attempted to alight from the car after it had started, and such act was negligence on her part, the jury should find for defendant, it was not error to refuse a requested charge that, if plaintiff attempted to alight from the car while it was in motion, she could not recover.

3. In an action for personal injuries, it was not error to refuse a charge that, if the jury find that plaintiff is not entitled to recover, they need not consider the character or extent of plaintiff's damages, whether serious or not, especially where the jury were cautioned by other instructions not to permit their sympathies to enter into their consideration of the case.—(West Chicago St. Ry. Co. vs. McCafferty, 77 N. E. Rep., 153.)

INDIANA.—Negligence—Nature—Carriers—Injuries to Passenger—Complaints—Sufficiency—Street Railroads—Construction of Track—Maintenance of Streets—Carriers—Carriage of Passengers—Assisting Passengers to Alight—Obligation—Defective Construction of Track—Complaint—Excavation in Street—Personal Injury—Contributory Negligence—Pleadings.

1. Actionable negligence consists in a breach of a duty owing from one to another, by reason of which the latter is injured.

2. A complaint, in an action against a street railway company for injuries to a passenger while alighting from a car in consequence of the distance from the step of the car to the surface of the street, alleged that the surface of the street was lower than the top of the rail of the track, but did not aver that the track was not laid to conform to the established grade of the street. Held, that it would be presumed that the track conformed to the established grade, as required by Burns' Ann. St. 1901, Sec. 5454, and the complaint did not show a negligent construction of the track.

3. A street railway company is not charged with the maintenance of streets occupied by its tracks outside of that part of the street actually occupied by it.

4. The duty of those in charge of a street railway car to aid passengers to get on and off only arises where there is an apparent necessity for such assistance brought to their attention.

5. A complaint, in an action against a street railway company for injuries to a passenger while alighting from a car in consequence of the distance from the step of the car to the surface of the street, alleged that the step was 2 ft. above the top of the rail of the track; that, owing to the condition of the street, the step

stood 3 ft. above the level thereof; that the company did not furnish an aditional step, whereby the egress from the car might be made in safety. Held not to show negligence in failing to furnish an extra step to enable the passenger to alight in safety.

6. Proof that a female passenger on a street car was fifty years of age, 5 ft. tall, and weighed from 185 to 200 lbs., does not show as a matter of law that she was infirm or unable to alight from the car, either on account of her age, or weight, or because the step on the car was 3 ft. from the street, so as to make it obligatory on the part of the servants operating the car to assist her.

7. A complaint, in an action against a street railway company for injuries to a passenger, while alighting from a car, in consequence of the distance from the step of the car to the street which alleged that the top of the track was a foot higher than the surface of the street contiguous thereto, did not charge negligence in the construction of the track in that it was not constructed on the proper grade or because of the condition of the street outside of the part which it occupied.

8. A complaint, in an action against a street railway company for injuries to a passenger while alighting from a car, in consequence of the distance from the step of the car to the street, which alleged that an excavation in the street existed at the point where the passenger attempted to alight, that the company and its servants knew of its existence, and that in attempting to alight the passenger "fell heavily upon the earth," did not show that the company was negligent by reason of the excavation in the street; there being no connection between the injury and the excavation.

9. Acts 1899, p. 58, c. 41 (Burns' Ann. St. 1901, Sec. 359a), providing that in actions for personal injuries it shall not be necessary for plaintiff to allege want of contributory negligence, does not change the common-law rule that where the facts alleged in the complaint show that plaintiff was guilty of contributory negligence, the complaint is insufficient on demurrer for want of facts.

10. Where a passenger, injured while alighting from a street car in consequence of the distance from the step of the car to the street, had as good an opportunity as the carrier or its servants to observe the conditions and to know whether the conditions were dangerous in an attempt to alight, the passenger was guilty of contributory negligence, precluding a recovery, the law requiring a person to use his own faculties so as to avoid danger if he can reasonably do so; and one will be deemed to have actually seen what he could have seen, had he looked.—(Indianapolis Traction & Terminal Co. vs. Pressel, [No. 5623], 77 N. E. Rep., 357.)

KANSAS.—Street Railways—Frightening Horses—Negligence—Question for Jury.

Where, in an action against a street railway company for injuries to a traveler in consequence of his horse being frightened by a car, the testimony showed that that car when approaching the traveler was running more rapidly than he was driving, that the motorman was sounding his gong loudly, that the horse became frightened, that though the danger to the traveler was apparent the motorman continued to run his car toward the horse and to ring the gong loudly, the question whether the motorman was negligent in failing to do what he could to avert the threatened danger to the traveler so as to render the company liable was for the jury.—(Dulin vs. Metropolitan St. Ry. Co., 83 Pac. Rep., 821.)

MARYLAND.—Railroads — Crossing Accident — Negligence — Giving Signals—Evidence—Question for Jury—Contributory Negligence.

1. In the case of a collision at a crossing of a suburban electric car with a team, the fact that the car was an extra, running 14 seconds behind a regular at such a speed that, while it was going the distance between the cars, the team going at a rapid walk went 130 ft., does not show negligence of the railroad company.

2. Though a suburban electric car must give a signal when approaching a crossing, testimony of the persons in the wagon struck by it that they did not hear the gong sounded is not evidence to go to the jury on the question of negligence, as a whistle might have been sounded.

3. The driver of a team which was struck by a suburban electric car at a crossing is precluded from recovering by contributory negligence, though the car was an extra, running 14 seconds behind the regular car; he having merely stopped at a distance of 130 ft. from the crossing, at which time the regular passed, and then driven forward at a rapid walk, without again stopping or looking, except directly in front of him.—(Hatcher vs. McDermot, 63 Atl. Rep., 214.)

MINNESOTA.—Attorney and Client—Lien—Right of Action—Assignment—Rights Subject to—Compromise by Client—Continuance of Action by Attorney.

1. A lien cannot be created upon a mere right of action for personal tort.

2. A right to recover damages for a personal tort is a mere personal right, and not assignable before judgment.

3. B., claiming to have a right of action against a railway company for damages for personal injuries, made a written contract with G., an attorney at law, by which G. agreed to bring the action and to pay all expenses of the suit, and B. agreed to pay G., after the expenses had been paid, 50 per cent of all money received from the railway company as compensation for his injuries. The action was brought, and after a disagreement of the jury, while the case was on the calendar awaiting another trial, the plaintiff and defendant, without the consent or knowledge of G., settled the case. On a petition by G. for leave to proceed in the case to protect his interests, held:

(1) That G. had no lien upon the cause of action and was not the equitable assignee of an interest therein.

(2) That the plaintiff had a legal right to compromise the claim and dismiss the action without the consent of his attorney.

(3) That the petition for leave to continue the case was properly denied.—(Boogren vs. St. Paul City Ry. Co., 106 N. W. Rep., 104.)

MISSOURI.—Carriers—Street Railways—Duty to Passengers—Res Ipsa Loquitor—Petition—Scope—Trial—Instructions—Applicability to Pleadings—Appeal—Harmless Error—Instructions not Applicable to Case—Injuries to Passengers—Operation of Car—Instructions—Conflicting Instructions—Appeal—Verdict—Weight of Evidence—Review.

1. A carrier of passengers, either steam or street railway, is required, so far as it is capable by the exercise of a very high degree of care, to carry them safely and is responsible for all injuries resulting from even the slightest negligence on its part.

2. An explosion occurred on an electric car, breaking the window glass, causing the car to burst into flames and frightening the passengers, one of whom was injured by either jumping or being pushed out of a window. Held, sufficient to establish a prima facie case of negligence on the part of the carrier.

3. Where a petition in an action for injuries to a passenger on a street car alleged that the motor was defective, but also charged that the machinery, appliances, and parts of the car were defective, such allegation was sufficiently broad to include not only the motor, but all the other electric appliances with which the car was equipped.

4. Where, in an action for injuries to a street car passenger, the complaint alleged negligent operation of the car and that all the electric appliances of the car were defective, an instruction that if the explosion, flame and burning of the car were caused by any defect in the condition of the car or the apparatus thereof, or by any improper management resulting from any negligence on the part of the defendant, or its agents and servants, etc., plaintiff was entitled to recover, was not objectionable as submitting a cause of action not stated in the petition.

5. Where, in an action for injuries to a street car passenger, there was neither allegation nor proof that the car itself was defective, an instruction in favor of plaintiff that if the explosion, flame and burning of the car "were occasioned by any defect in the condition of the car or apparatus thereof," etc., though objectionable, could not have misled the jury.

6. Where there was evidence that the street car in which plaintiff was riding at the time she was injured was started with a jerk, that too much power was applied and that in such case there was more likelihood of an explosion such as occurred than when the power was properly applied, it was proper to direct the jury's attention to the management of the car and charge that if the explosion and fire were caused by the mismanagement of the motorman, plaintiff was entitled to recover.

7. In an action for injuries to a street car passenger, the court charged on plaintiff's behalf that, if on an explosion occurring in the car, followed by fire, plaintiff became so alarmed that she endeavored to escape and was injured in so doing, and the explosion and burning of the car were occasioned by any defect in the condition of the car or apparatus, or by any improper management thereof, and if such defect or improper management resulted from any negligence on defendant's part for failure to exercise the highest degree of care, skill and foresight, etc., the jury should find for plaintiff. The court, on defendant's behalf, charged that if prior to the accident defendant had employed competent inspectors to inspect the electrical appliances used on the

cars, and that such inspector had used a very high degree of care in making reasonable inspections of the car on which plaintiff was injured a short time prior to her injury, and that such inspection failed to disclose any defect in the electrical appliances which were apparently in a reasonably safe condition, and the accident in question could not have been reasonably anticipated by the exercise of a very high degree of care in inspecting the car, etc., plaintiff could not recover. Held, that such instructions were not contradictory.

8. Where the trial court, in the exercise of its discretion, has overruled a motion for a new trial because the verdict is against the weight of the evidence, such question will not be reviewed on appeal.—(Brod vs. St. Louis Transit Co., 91 S. W. Rep., 993.)

MISSOURI.—Master and Servant—Personal Injuries—Defective Rail—Evidence—Question for Jury—Combined Negligence of Master and Fellow Servant—Contributory Negligence—Street Car—Excessive Speed—Responsibility of Conductor—Trial—Instructions—Assumption of Fact in Issue—Master and Servant—Injuries to Servant—Violation of Ordinance—Contributory Negligence—Ignoring Issues.

1. In an action by a street car conductor for injuries resulting from the derailing of the car because of an alleged defective rail, evidence held sufficient to justify submission to the jury of the question of defendant's negligence.

2. A master is liable to a servant injured by the master's negligence, even though the negligence of a fellow servant contributed to the result.

3. Where a street car conductor was injured through the derailment of the car because of an alleged defective rail, the fact that the car was at the time running at an excessive rate of speed and might not have left the track had it been running slower did not show the conductor to be guilty of contributory negligence, since, though he had general control of the car, it was not within the scope of his duty to regulate the speed at all times.

4. In an action by a street car conductor for injuries from the derailment of the car because of an alleged defective rail, an instruction that if the jury believed that plaintiff was injured by reason of the car leaving the track on account of a defective rail, and not because of any fault on his part, they should find for the plaintiff, etc., was not objectionable on the ground that it assumed that the rail was defective.

5. Where a master's orders require a servant to violate an ordinance, the master cannot, in action by the servant for injuries, claim that the violation of the ordinance constituted contributory negligence.

6. In an action by a street car conductor for personal injuries from the derailment of a car through an alleged defective rail, in which there was evidence that the car was running at an excessive rate of speed, but also evidence that that rate of speed was required by the schedule time, an instruction implying that plaintiff could not recover if he was in control of the car, and if it was being run at a greater speed than was allowed by ordinance was erroneous, because ignoring the question of defendant's orders as to speed.—(Moore vs. St. Louis Transit Co., 91 S. W. Rep., 1060.)

MISSOURI. — Carriers — Injuries to Passenger — Petition — Proof — Sufficiency — Pleading — Inducement — Appeal—Objections Not Raised Below—Trial—Instructions—Cure of Error—Negligence—Personal Injury—Contributory Negligence—Burden of Proof—Failure to Request.

1. An allegation in the petition, in an action against a street railway company for injuries received by a passenger while attempting to board a car in consequence of the sudden starting of the car, that it had come to a stop when signaled, and when plaintiff attempted to board it, is supported by evidence showing that the car had, on plaintiff's signal, so slackened its speed that it barely had a perceptible motion at the time he attempted to board it.

2. An allegation in the petition, in an action against a street railway company for injuries received by a passenger while attempting to board a car in consequence of its sudden starting, that the car came to a stop when signaled, is a matter of inducement, and the negligence consists in the starting of the car.

3. An objection to the admissibility of evidence not made in the trial court will not be considered on appeal.

4. Where, in an action against a street railway company for injuries received by a passenger while attempting to board a car, the court directed the jury not to find for plaintiff if he was guilty of negligence, the error in a charge that, before plaintiff's right to recover could be defeated, defendant must show that plaintiff failed to exercise ordinary care, arising from the failure to state that before plaintiff's right to recover could be defeated on the ground of contributory negligence, defendant must prove a failure to exercise ordinary care, was not prejudicial.

5. An instruction, in an action for personal injury negligently inflicted, that before plaintiff's right to recover could be defeated defendant must show that plaintiff failed to exercise ordinary care, correctly imposed on defendant the duty of showing that plaintiff failed to exercise ordinary care, and that such failure caused the injury.

6. Where an instruction on the measure of damages in a personal injury action was not improper, and defendant desired that it should state in greater detail the elements of damage, he should so request.—(Forrester vs. Metropolitan St. Ry. Co., 91 S. W. Rep., 401.)

MISSOURI.—Street Railroads—Injuries to Pedestrians—Actions—Sufficiency of Evidence—Contributory Negligence.

1. In an action against a street railway for the death of a person crossing its track, caused by a collision with a car, evidence held to show that the car which struck deceased was not exceeding the speed of 15 miles an hour, which it was authorized by ordinance to maintain.

2. A passenger on a west-bound street car, who alighted from his car, passed in the rear thereof, and started to cross the east-bound track of the street railway, when he was struck by an east-bound car, was guilty of contributory negligence where he failed to look for the car which struck him and proceeded to cross the track, absorbed in a newspaper, without any attention to his surroundings.—(Deane vs. St. Louis Transit Co., 91 S. W. Rep., 505.

MISSOURI.—Pleading—Separate Causes of Action—Election—Appeal—Curing Errors—Defective Pleading—Witnesses—Impeachment of One's Own Witness—Surprise—Street Railroads—Injury to Person on Track—Willfulness—Petition—Instructions—Willful Injury—Evidence—Contributory Negligence.

1. Where plaintiff joined in the same count a cause of action for common-law negligence, one based on the violation of a city ordinance, and another on wilfulness, recklessness, or wantonness, it was error for the court to refuse to compel plaintiff to elect on which he would stand; such causes of action being improperly joined.

2. The error was not cured by the court afterwards striking out allegations in the petition alleging a violation of the vigilant watch ordinance.

3. Defendant's motorman, who ran his car against plaintiff, made two written statements for defendant, and afterwards gave his deposition, taken by plaintiff, in which he stated that immediately before the accident he was looking straight ahead of him, and that plaintiff rose up from the trench across the track "instantly," and so close to him that he could not stop the car before striking him. He voluntarily resigned his position as motorman, and later, while endeavoring to get his job back, voluntarily went to plaintiff's attorney and made a statement directly contradictory to his former statements and testimony. A change of venue having been taken, plaintiff took the motorman to the place of trial, paying his expenses, but did not offer him as a witness, thereby preventing defendant from using his deposition, whereupon defendant called him, and he testified, contrary to his deposition and written statements, to material facts prejudiced to defendant. Held, that defendant was entitled to claim that it was surprised by the witness' testimony, and to lay a foundation for his impeachment by the introduction of his deposition and written statements.

4. Where a petition, in an action for injuries to a person struck by a street car, contained no allegation of wilfulness, recklessness, or wantonness on the part of the motorman, it did not state a case under the humanitarian doctrine.

5. In an action for injuries to plaintiff by being struck by a street car, the court charged that, even though plaintiff was negligent in working between defendant's tracks and such negligence contributed to the injury, still if plaintiff had so placed himself in the dangerous position and thereafter such dangerous position became known, or by looking could have become known, to defendant's motorman, in time to have stopped the car by the exercise of ordinary care, and thereby avoid the injuries complained of, and he failed to do so, plaintiff was entitled to recover. Held, that such instruction was erroneous as based on the "last clear chance doctrine," which does not obtain in Missouri.

6. Where, in an action for injuries to plaintiff by being struck by a street car, the motorman operating the car knew that plaintiff had been working at or near the point of the accident for at

least a week before that, and testified that plaintiff was a friend of his, and that he would not have struck him if he possibly could have avoided doing so, there was no evidence of recklessness, wantonness, or willfulness sufficient to sustain an instruction in plaintiff's favor on the humanitarian doctrine.

7. Where plaintiff was struck by a street car while working in a trench under the street car track, he was not entitled to rely on the motorman of an approaching car giving him warning of such approach, nor on his sense of hearing alone, and was guilty of contributory negligence precluding his recovery by permitting his mind to become so engrossed in his work that he failed to take proper precautions, either by looking or listening to ascertain the approach of the car.—(Clancy vs. St. Louis Transit Co., 91 S. W. Rep., 509.)

MISSOURI.—Street Railroads—Collision—Negligence—Contributory Negligence—Instructions—Appeal—Harmless Error—Evidence to Authorize Instructions—Modification of Instructions—Refusal of Instructions—Reliance on Care of Motorman — Collision — Action — Trial — Refusal — Other Instructions—Appeal—Harmless Error—Admission of Evidence—Damages—Injuries to Person—Excessive Damages.

1. Where the driver of a vehicle, owing to the fact that another vehicle was approaching her between the curb and a street car track, drove upon the track about 40 feet ahead of a car approaching at the rate of 6 or 7 miles an hour, and while the vehicle was preceding the car a collision occurred, the motorman was guilty of negligence, under an ordinance requiring a motorman to stop on the first appearance of danger.

2. The driver of the vehicle was not guilty of contributory negligence either in going upon the track or in driving along ahead of the car.

3. In an action for injuries sustained in a collision between plaintiff's vehicle and a street car, an instruction for plaintiff was not erroneous for failing to take into consideration the contributory negligence of plaintiff; it having authorized a verdict for plaintiff only in case she was exercising ordinary care at and before the time of the injury.

4. Defendant could not complain of an instruction because it merely required the motorman to use common-law care, while the petition charged a violation of an ordinance requiring a motorman to stop on the first appearance of danger.

5. Where, in an action for injuries sustained by plaintiff in a collision between her vehicle and a street car, plaintiff's evidence showed that the car was running 15 miles an hour, and that the motorman could have seen the vehicle when he was more than 500 feet away, and defendant's evidence showed that the car was going at the rate of 6 or 7 miles an hour when the motorman saw the vehicle on the track 40 feet ahead, an instruction authorizing a recovery for plaintiff if by reason of excessive speed the motorman was unable to avert a collision was not objectionable on the ground that there was no evidence showing within what space the car could have been stopped.

6. Defendant requested an instruction that if the motorman, on seeing the vehicle, reversed his power and applied the brakes, and thus would have averted the accident but for the fact that the driver of the vehicle was prevented from getting off the track by reason of another vehicle in front of it, and that the collision was due to such failure, plaintiff was not entitled to recover unless the motorman knew or could have known that the plaintiff's vehicle was so obstructed in time to have stopped the car, which instruction was modified by adding, "unless excessive speed prevented stopping the car." Held, that the modification was proper; it appearing that if the motorman had applied his brakes as soon as he saw the danger the accident would have been averted, and the special defense pleaded being that the accident was caused by plaintiff, who was driving so close in front of the car as to render a collision unavoidable.

7. Where, in an action for injuries sustained in a collision between plaintiff's vehicle and a street car, there was nothing to show that the motorman saw that plaintiff, driving ahead of the car, was attempting to get off the track, it was proper to refuse an instruction that the motorman had a right to assume that the driver of the vehicle would use reasonable diligence and get off the track and out of the way, unless the motorman knew, or by the exercise of reasonable care might have seen or known, that the vehicle was hindered or impaired in its progress by a vehicle in front of it.

8. The driver of a vehicle has a right to presume that a motorman will so run his car that a collision will not occur with a vehicle, even though the driver of the vehicle does not do his duty.

9. In an action for injuries sustained in a collision between plaintiff's vehicle and a street car, the motorman having testified that the car was running at the rate of 6 or 7 miles an hour when he saw the vehicle preceding the car, and that he then applied the brakes and reversed the current, it was proper to refuse an instruction that, if the motorman was unable to stop the car plaintiff could not recover.

10. There is no error in refusing instructions substantially covered by others.

11. In an action for injuries, there was no error prejudicial to defendant in admitting testimony that plaintiff had visited certain places in an attempt to regain her health; it appearing that in consequence of such visits her health had improved.

12. In an action for injuries, defendant having sought to have plaintiff identify written statements said to have been made by her, there was no prejudice to defendant in her testimony that she did not sign one of them; the statements not being offered in evidence.

13. Where, in an action for injuries, it appeared that plaintiff was in good health prior to the accident, and that she received injuries to her side, uterus, ankle, spine and nerves; that she was suffering from traumatic neorosis, her condition being one of nervous debility and exhaustion; and that she probably would not fully recover—a verdict for $9,000 was not excessive.—(Latson vs. St. Louis Transit Co., 91 S. W. Rep., 109.)

MISSOURI.—Carriers—Who are Passengers—New Trial—Newly Discovered Evidence—Diligence—Sufficiency of Newly Discovered Evidence—Misconduct of Jury—Proceedings to Procure—Deposition—Damages—Personal Injuries—Excessive Damages.

1. One who attempts to enter a street car for the purpose of taking passage, when it stopped for him on signal, is a passenger, though he saw no conductor or motorman on the car.

2. An affidavit of the owner of a drug store that the plaintiff in an action for personal injuries, at the time of the accident, walked into the store without assistance, is insufficient to authorize a new trial on the ground of newly discovered evidence to meet the evidence of the plaintiff that he was compelled to use crutches ever since the injury complained of, since the exercise of reasonable diligence would have procured such testimony before or at the time of trial.

3. Where there was overwhelming contradictory testimony to alleged newly discovered evidence, so that the court could not say that the testimony of the affiant would produce a different result, a new trial was properly denied.

4. An affidavit of a juror will not be considered on motion for a new trial on the ground of misconduct of the jurors.

5. On motion for a new trial in an action for personal injuries, the refusal of the court to appoint a special commissioner to take depositions, on a showing that the applicant could in that way procure testimony as to the misconduct of the jury and as to newly discovered evidence, which it could not procure by voluntary affidavits, was not error.

6. In an action for personal injuries, where the plaintiff, a lawyer 70 years of age, had his thigh bone fractured, was laid up for several months, was compelled to go on crutches, and the injury was likely to result in permanent lameness, and he estimated his income at $2,500 a year, an award of $15,000 damages was excessive and should be reduced to $10,000.—(Devoy vs. St. Louis Transit Co., 91 S. W. Rep., 140.)

NEW YORK.—Carriers—Injury to Passenger Alighting from Street Car—Negligence—Evidence.

Where plaintiff sued for an injury on the theory that the street car on which he was a passenger stopped for him to alight, and, while he was doing so, started without giving him sufficient time, throwing him to the ground, a verdict for him is against the weight of evidence; he having no testimony but his own, the conductor's testimony that plaintiff attempted to alight while the car was moving being corroborated by two passengers, and plaintiff admitting that he told defendant's claim agent that the car "did not stop, and as it was turning slowly and kind of stopped I stepped off," though he explained that by "kind of stopped" he meant it stopped "for a minute or half a minute or ten seconds, enough to step off."—Maurer vs. Brooklyn Heights R. Co., 96 N. Y. Sup., 1065.)

NEW YORK.—Injuries to Passengers—Position—Negligence—Assumed Risk—Evidence—Contributory Negligence.

1. While it is not negligence per se for a passenger to occupy a position on the platform of a crowded street car if accepted as a passenger, he nevertheless assumes the ordinary risks incident to such position.

2. Where plaintiff, a passenger on a street car, was thrown from the platform thereof as it was rounding a curve, evidence that the

speed of the car was "pretty swift," "about nine miles an hour," and that the movement was not "an ordinary jolt," was insufficient to establish negligence on the part of the carrier.

3. Where plaintiff, prior to being thrown from the platform of a crowded street car as it was rounding a curve, had knowledge of his situation, and that he was in a position that exposed himself to the danger of being thrown by any jolting or swaying of the car, but did nothing to protect himself, and did not even look to see whether there was anything from which he could obtain support, he was guilty of contributory negligence.—(Kiefer vs. Brooklyn Heights R. Co., 97 N. Y. Sup., 841.)

NEW YORK.—Eminent Domain—Street Railways—Damages to Abutting Owner—Evidence—Appeal—Reversible Error—Findings.

1. In an action for damages to plaintiff's premises by the maintenance of an elevated railroad in front of the property, evidence held to show that the property had been increased in value by the construction of the road.

2. In an action for damages owing to the maintenance of an elevated railroad in a street on which plaintiff's property fronted, the refusal of the court to find that easements of light, air, and access, aside from any consequential damages, if any, from the taking of the easements, had in themselves only a nominal value, was reversible error.—Schmitz vs. Brooklyn Union Elevated R. Co., et al., 97 N. Y. Sup., 791.

NEW YORK.—Master and Servant—Injuries to Servant—Contributory Negligence—Assumption of Risk—Evidence—Opinion Evidence—Competency.

1. An elevated railway structure had three tracks, between each of which was a narrow board walk, and which had a wider walk on the outside of each of the outer tracks. A servant, engaged in repair work on the structure, voluntarily walked on one of the inside walks instead of an outside walk, and, although he had worked on the structure for nearly a month and knew that trains were passing constantly at the place in question, failed to keep any outlook for approaching trains, or to take any precautions to protect himself. While he was in that situation a local train approached him on one track, and in throwing his body away from it he came in contact with an express train on the next track and was killed. Held, that he was guilty of contributory negligence.

2. A servant held to have assumed the risk of any danger in his manner of work.

3. In an action for the death of a servant, testimony of a nonexpert witness, based on his experience as a workman and foreman of work at the place of the accident, that it would be a "good idea" to establish a certain rule for the protection of workmen at the place in question, and that they could not be protected without such a rule, was incompetent.—(McLaughlin vs. Manhattan Ry. Co., 97 N. Y. Sup., 719.)

NEW YORK.—Negligence—Contributory Negligence—Street Railways—Injury to Pedestrian.

1. Where a party by his own acts creates a controlling presumption of contributory negligence, he is guilty thereof, as a matter of law.

2. In an action to recover for injuries received by being struck by an electric car while crossing the public street, evidence held to show that plaintiff failed to exercise ordinary prudence, and was guilty of contributory negligence as a matter of law.—(Lofsten vs. Brooklyn Heights R. Co., 76 N. E. Rep., 1035.)

NEW YORK.—Street Railways—Injury to Pedestrian—Contributory Negligence—Giving Notice of Approach of Car—Assumption That Car Would be Operated Safely.

1. Plaintiff, while crossing a street, saw cars approaching from the north and south. The south-bound car was 40 ft. or 50 ft. away. He paid no attention to it, but walked in front of it, and was injured. There was nothing to obstruct his view nor to distract his attention except the north-bound car. Held, as a matter of law, that plaintiff was guilty of negligence precluding a recovery, though the company was negligent.

2. Whether any notice was given of the approaching car was immaterial, because plaintiff knew it was approaching.

3. Plaintiff did not have the right to assume that the car would be so controlled as to enable him to cross in safety.—(McEntee vs. Metropolitan St. Ry. Co., 97 N. Y. Sup., 476.)

NEW YORK.—Death—Action for Causing Death—Cause of Death—Sufficiency of Evidence—Proximate Cause of Disease—Evidence—Questions for Jury.

1. In an action for causing death, the evidence showed that decedent before the accident was in perfect health, that his injuries consisted of a fractured rib and a severe bruise on the left side, that he gradually grew worse and at the end of the second week pleurisy developed in the region of the fractured rib, that shortly thereafter a tubercular condition of the left lung was discovered and death resulted therefrom in about nine weeks after the injury. Held to warrant a finding that the injury negligently inflicted was the direct cause of death.

2. Where there is evidence from which a jury may find an unbroken connection and continuous operation between a disease and an injury negligently inflicted, it is for the jury to determine whether the negligence causing the injury is the proximate cause of the disease, and if they find it is, a recovery of the damages sustained in consequence of the disease may be had.—(Sallie vs. New York City Ry. Co., 97 N. Y. Sup., 491.)

NEW YORK.—Street Railways—Crossing Accidents—Injuries—Negligence—Contributory Negligence — Precautions — Duty of Motorman—Reasonable Care.

1. In an action against a street railway for injuries received while attempting to drive over a crossing, by collision with defendant's car, evidence examined and held to show contributory negligence on plaintiff's part.

2. Where plaintiff knew that defendant street railway ran its cars at a speed of from forty to forty-five miles an hour over a highway crossing. It was not sufficient for him to look for an approaching car for the last time before driving upon the tracks when he was 20 ft. distant therefrom, and his failure to look again before attempting to cross, there being a clear view all along the road, was negligence on his part, precluding a recovery for injuries received in a collision between his wagon and defendant's car.

3. While it was the duty of a street railway motorman, on approaching a crossing over which his car ran at a speed of from forty to forty-five miles an hour, to use reasonable care, negligence on the motorman's part in approaching the crossing did not excuse contributory negligence of one attempting to cross the tracks, in failing to look for an approaching car immediately before driving on the tracks.—(Fancher vs. Fonda J. & G. R. Co., 97 N. Y. Sup., 666.)

NEW YORK.—Carriers—Injury to Passenger—Evidence—Sufficiency.

In an action against a street railway company for injuries to a passenger, plaintiff testified that she had stood up preparatory to alighting, and signaled the conductor, when the car gave a sudden jerk and "knocked her somewhere," after which she had no further remembrance, and it appeared that she had received traumatic injuries. Held, that the evidence was sufficient to raise a presumption of negligence.—(Lomas vs. New York City Ry. Co., 97 N. Y. Sup., 658.)

NEW YORK.—Carriers—Street Railways—Contributory Negligence—Cars Required—Negligence.

1. When a passenger was unable to obtain a seat in a street car, she was not guilty of contributory negligence, as a matter of law, in riding on the running board of the car.

2. Where a street car company permitted a passenger to ride on the running board, and accepted her fare as a passenger, it was obliged to exercise extraordinary care to transport her to her destination without injury.

3. Plaintiff, a girl 17 years old, boarded a street car and, being unable to get inside because of the crowd, stood on the running board, holding onto one of the stanchions. The conductor, in passing along to collect fares, swung himself around the passengers on the running board, and in doing so was struck by one of the trolley poles, located 4 ft. 5½ in. from the track, the nearest face being 2 ft. 8½ in., and struck plaintiff, causing the injuries complained of. Held, that there were two concurring causes which produced the injury—one, the overcrowding of the car, and the other, the conductor's act in coming in contact with the pole—both of which were the negligence of the carrier.—(Horan vs. Rockwell, 96 N. Y. Sup., 973.)

NEW YORK.—Street Railways—Operation—Injury to Person Near Track.

1. In an action for injuries, evidence held to show that the person injured did not back from a street car track as rapidly as he could, as he claimed, to avoid an injury from being struck by the rear end of the car as it rounded the curve and projected beyond the track.

2. Whether the motorman of a street car rang his bell before starting the car was immaterial, where the person injured by it saw the car before it started.—(McCabe vs. Interurban St. Ry. Co., 97 N. Y. Sup., 353.)

LONDON LETTER

(*From Our Regular Correspondent.*)

Last month reference was made to the tour which the Kindred Institutions were making as guests of the Institution of Electrical Engineers through England and Scotland, so that it is not necessary at this time to repeat what has been already written. Suffice it to say, that the visit has been an unqualified success, and many expressions of good feeling were exchanged between British engineers who accompanied the party and the visitors. The corporations in the various cities which were visited have certainly earned for themselves the gratitude of the Institution of Electrical Engineers, as they extended most cordial hospitality and interesting entertainment. In Birmingham, Manchester, Liverpool, Glasgow, Edinburgh, Newcastle and Leeds, everything was done for the visitors that could possibly be conceived, and not only were the various electrical engineering institutions of these cities thrown open to the visitors, but entertainments in the form of luncheons, receptions and conversaziones, were freely offered. It would be almost invidious to pick out now which of the entertainments were most enjoyable, but certainly the visitors enjoyed in no small measure their visit to Windsor, and the trip up the Thames. The voyage through the Shakespeare country was also most enjoyable, while, after the more strenuous entertainments of Manchester and Liverpool, the trip to Glasgow by way of the English lakes was certainly very refreshing. One of the most enjoyable entertainments of the whole visit was undoubtedly that extended to the whole party by Babcock & Wilcox, who are past masters in the art of entertaining on the River Clyde. The entire party visited this company's works at Renfrew, being taken there by special train, which afterward proceeded to Greenock, where the party embarked on the magnificent Clyde turbine steamer "Queen Alexandra," on which they remained for the rest of the day. The trip was as usual by way of the Kyles of Bute and Lochfyne and it would be impossible to conceive a better day for the purpose in every respect. Mr. Rosenthal, the managing director of this most enterprising company, not only proved himself to be the perfect host, but also to be a linguist of great proficiency, as he replied to the toast of his company in three languages. Edinburgh also naturally proved a strong attraction for the visitors, and Newcastle-on-Tyne had much to offer in the way of interesting visits to the different works. The visitors had the opportunity of inspecting, while at Glasgow, the enormous new Cunard steamship, the "Lusitania" in the works of John Brown & Company, at Clydebank, and while at Newcastle-on-Tyne they had the privilege of seeing her sister ship, the "Mauritania," which are now the two largest ships in the world and are destined to regain the "blue ribbon" of the Atlantic for Great Britain. The visit was brought to a close at Leeds, where, after various receptions and visits to engineering works, an excursion was made to Harrogate and Fountain Abbey and Studley Royal, where, as usual, the visitors had a most enjoyable time and were favored with the very best kind of weather. It remains only to say that the arrangements for the whole trip were absolutely perfect, and to those who had the work in charge, a word of praise must be extended.

We regret to have to record during the past month a series of tramway accidents which have occurred in various parts of England, all of which appear to be of practically the same nature. In each case the car has got the better of the motorman on a down grade, the brakes have become inoperative and the car has dashed to the foot of the hill, with very serious and fatal consequences. Such an accident has occurred in London on the system of the Metropolitan Electric Tramways, Ltd., on the steep descent underneath the Archway at Highgate, resulting in the loss of several lives. An accident of a similar nature took place also at Halifax, where they are many extremely steep grades, another at Swindon and also one at Huddersfield. It seems curious that all of these accidents should have occurred about the same time, and upon inquiry it would appear that all of the cars have been well equipped with brakes, so that it would appear difficult to be able to find the exact reason of the accidents. The magnetic brake was fitted on at least two of the cars which came to grief, but as the wheels were found locked, it would appear that this brake would be useless, as its efficacy necessarily depends upon the revolution of the wheels. Owing to the accidents there has been a great hue and cry about the equipments of cars in almost every city in Great Britain, and various reasons have been attributed for the catastrophes. The awful disaster to a "Vanguard" motor omnibus, which was journeying with a pleasure party to Brighton, has also called the attention of the authorities to the braking facilities on these vehicles, so that the whole subject of braking in England just now is a very live one. At the inquest on the Highgate disaster, the jury returned a verdict of "accidental death," adding that the accident was caused by the brakes failing to act when they were being applied, without the exercise of proper skill on the part of the driver, who, in the opinion of the jury, was insufficiently trained for his duties. One of the reasons doubtless of the Highgate disaster appears to have been that the magnetic brake on the car was regarded only as an emergency brake and was not used in ordinary working. Many of the cities where the roads are extremely hilly, have their cars fitted with slipper brakes, and orders are issued to all the drivers to always use these slipper brakes whenever the car enters upon a gradient. In Hastings, for instance, where there are some very severe gradients, a very powerful slipper brake has been invented by Mr. Holliday, the manager of the system, who considers that it is impossible for an accident of this kind to occur on his system. He has now taken out patents for his particular brake, and is in a position to recommend it for other systems, having made arrangements with a firm of manufacturers to put it on the market.

The annual report of the Manchester Corporation Tramways contains some remarkable figures. During the twelve months 133,923,932 passengers were carried, against 126,900,875 in the preceding year, and the receipts were £661,806, against £628,529. There are 157 miles 647 yards of track, and the cost of working cars per mile is 5d., and the average receipts for the same distance 10.84d. Of the passengers 70.76 per cent paid penny fares, 11.57 three-halfpenny fares, 6.25 halfpenny, and only 0.32 fourpenny fares. The net balance on the year's working was £232,097, and after the payment of interest, renewals, etc., £46,000 was contributed to the relief of the rates.

Messrs. J. G. White & Company, Ltd., of London, announce that they have extended their present offices by taking a lease of the new building recently erected by the Skinners' Company, in Cloak Lane, and that hereafter the registered address of the company and the public entrance to the offices will be 9 Cloak Lane, Cannon Street, London, E. C.

The Light Railways Commissioners have postponed the public inquiry into the application of the Highgate Hill Tramways Company for permission to electrify the Highgate Hill Steep Grade Cable Tramway (the first cable tramway constructed in England), and to construct an electric tramway to join up that line with the Middlesex Light Railway at a point near the junction of North Hill and Archway Road. The scheme is opposed by the Hornsey Borough Council, the governors of Highgate School, and an influential committee of private residents.

The South Lancashire Tramways Company has commenced running cars on its new extension from Leigh boundry to Lowton, St. Mary's Station. This will link up Leigh with the Great Central Railway Company's system, thus somewhat interfering with the monopoly hitherto enjoyed in the Leigh district by the London and North-Western Railway Company. The work of extending the tramlines from Boothstown through Worsley to Winton, so as to link up with the Manchester and Salford tramways, is expected to be completed in August, thus coupling the tram connection between Manchester and Liverpool via Tyldsley.

The system of the Bath Electric Tramways Company, which now covers about 19 miles, practically all single track, is to be extended from Newton St. Loe to Saltford, a boating center on the Riven Avon. Thence it is only 2½ miles to Keynsham, the point to which the powers of the Bristol Tramways extend. These lines, however, actually terminate at Brislingdon, and the distance from there to Saltford is covered by a motor bus run by the Bristol Tramways. Thus, when the proposed extension of the Bath Tramways is completed it will be possible to travel the whole distance between the two towns by tram. This will be an important development, as it will link a number of towns, such as Devizes, Trowbridge, Bradford-on-Avon, Chippenham, and the villages of Box, Midsomer Norton, and Timsbury, etc., to which the Bath Tramways Company maintain an excellent service of motor buses with Bristol and the seaboard.

The annual report of the Wolverhampton Corporation Tramways Committee, which was issued recently, shows that a profit of £1,192 was made on the Lorain system of electric tramways in the borough. The running of motor omnibuses from Wolverhampton to Penn Fields has resulted in a loss of £179 during the year.

A joint meeting of the tramways committee composed of representatives of the Dewsbury and Ossett Corporations and

Soothill Nether District Council was recently held at the Dewsbury Town Hall. The three authorities named have obtained powers to construct tramways between Dewsbury and Ossett, by which means a through connection will be made between Dewsbury and Wakefield, as trams already run between the latter place and Ossett. It was decided to execute an agreement with the National Electrical Constructional Company, Ltd., London, for the construction of the line from Dewsbury to Ossett by way of Wakefield Cutting, with the branch line to Earlsheaton.

The Light Railway Commissioners have granted the Herts County Council an order to construct tramways in Watford and Bushey up to the Herts border at Stanmore, it being intended eventually to link up with Edgware and the Marble Arch tramways should they be constructed, and so give the neighborhood direct tramway access to London at Kingston.

The motor omnibus, of which there must be at least five hundred now running in the streets of London, is on its probation. For the past year or so, the police have not interfered with it in any way, but complaints from house owners and from the public in general have been so great of late on account of the terrible noise made by these buses, together with the serious vibration, and the most repulsive smoke and fumes which they emit, that action has had to be taken. The crisis has been brought about also to some extent by the terrible catastrophe which befell the "Vanguard" bus on the Brighton Road, as already mentioned. It got beyond control at the famous hill at Handcross, broke all its brakes and finally dashed into a tree, causing the almost immediate death of about a dozen voyagers. Sir Edward Henry, the chief commissioner of police, has now published a letter in the "Times" in which he refers to the inconveniences and dangers arising from motor omnibuses, and the difficulties that have to be contended with in dealing with the problem. He remarks that motor omnibuses have undoubtedly come to stay, but only time can evolve the type best fitted for use in the London streets. The police are well aware of the great inconvenience caused to the public by these motor buses at present, but he states that the causes of excessive noise and the emitting of noxious vapors are not really offenses under the acts or regulations. The police have powers, however, over public vehicles, and he stated that they had not interfered seriously with the working of these buses for the reason that they did not wish to hurt a young and growing industry. They have come to the conclusion, however, that the time is now ripe when the companies operating motor buses should redeem their promises to make suitable vehicles for London streets. There has been also a large amount of correspondence from various interested parties in this problem, especially from the managers of motor omnibus companies saying that they are well aware of the nuisance they are creating, and are doing all in their power to secure better and more silent vehicles and are also using every endeavor to educate their drivers to such a point that the emitting of these noxious fumes will be reduced to a minimum. The chief trouble appears to be in the matter of lubrication, as it is not automatic, but largely under the control of the driver, who pumps oil into the engine, which is vaporized and emits huge volumes of smoke, especially on starting. The older vehicles will undoubtedly have to disappear from the streets, as their depreciation is such that they are either inefficient, or create such a horrible noise that they will not be permitted in the streets. The matter of depreciation in these vehicles must be something enormous, and much money will have to be spent before the perfect vehicle is evolved. It is generally now conceded, that no amount of complaint will kill the industry, and while there are thousands of complainers, yet there are also tens of thousands of people who are benefitted by these motor omnibuses, and for the next ten years, at least, they will most indubitably be a feature of the London streets. Railways and tramways had their bad days; the motor buses are going through a similar period, but their emergence into the full light of public approval is just as sure.

The London County Council bill for authority to establish large central stations in London for the purpose of supplying electricity in bulk to authorized distributors, has been rejected by the select committee of the House of Commons, so that this year it is a "dead letter." The decision, however, was accompanied by important qualifications, and the committee recommend that the Council bring forward another bill next year much more comprehensive in its details, and state that the scheme should extend over the whole of London and to adjoining districts. They also state that the London County Council should be the authority. Pending the reintroduction of the Council's new bill, all other bills relating to the same subject are suspended. The committee also refer particularly to the matter of voltage, and point out that the bill previously brought forward by private enterprise, known as the administrative and county bill, referred to the voltage as 20,000 as against only 6600 proposed by the Council.

The House of Lords Select Committee has also allowed the clause in the London County Council General Powers Bill, relative to the supply of electric fittings, to proceed. It will, therefore, be possible for metropolitan boroughs and authorities under the scheme to supply fittings on the hire purchase system, and will result undoubtedly in educating small manufacturers to use more electrical energy. The London County Council has backed up the metropolitan boroughs in regard to this bill, many of the municipal authorities having hitherto been unucessful in securing the rights for themselves.

The London County Council has at last succeeded in its intention of securing permission to run tramways across Blackfriars and Westminster Bridges and along the Victoria Embankment, the scheme having at last passed its formal stages of third reading and has secured the royal assent. It is therefore now only a question of time when electric cars will be running along the Embankment and across these bridges, giving valuable connections between the northern and southern portions of London and providing also circular routes so as to relieve the congestion of traffic at the bridge termini. The benefit of a portion of the scheme will not, however, be felt for some years, as the running of cars across Blackfriars Bridge is conditional upon the widening of that bridge, which will necessarily take several years. There is no embargo, however, upon the running of cars over Westminster Bridge, and doubtless as soon as the London County Council can undertake the work it will be commenced. Thus has ended a bitter fight, which has been continued for the past five years, the efforts of the London County Council to put tramways along the Embankment and across the bridges having been bitterly fought by the various omnibus companies, and by the House of Lords who have always objected to the beautiful Embankment being spoilt, as they claim, by anything of so cosmopolitan a character as an electric tramway, preferring, doubtless, that it should be preserved as an avenue for motor broughams and private carriages. The opposition has at last, however, been beaten down, and soon the people of London will have some right to an avenue which was originally built for their own convenience.

The highways committee of the Council have also decided to buy the London Southern Tramways Company's undertaking and to electrify it immediately. This tramway extends at present from Vauxhall to Norwood, and the estimated total expenditure will be about £325,000, including the necessary street widenings. The lines comprise about 5¾ miles of horse tramways, and about 4 miles will be reconstructed on the overhead system, and 1¾ miles on the conduit system.

With regard to the danger threatening the continued working of the Greenwich Observatory, owing to the proximity of the new power house of the London County Council, it is only necessary to say that a committee of the London County Council and the Observatory officials are working amicably together for a solution of the difficulty. In the meantime, the London County Council has determined not to continue the erection of the two other chimneys, and they have been stopped at present about 50 ft. short of the height intended for them. There is no doubt that a settlement will be arranged in time, and careful experiments will be made during the next few months to find out definitely just what derangement is liable to take place at the Observatory.

It has been for some time well known that the new Baker Street and Waterloo tube has not been getting sufficient revenue to make it a paying enterprise, and it is now announced that the management have decided to change their method of charging fares. It was opened on the American system of having a uniform fare for the whole distance, which has proved quite successful on the Central London Railway. The conditions on the "Bakerloo" tube are, however, different, and it has now been decided to adopt a graduated fare, so as to try to attract more passengers. It might also be said that the District Railway, the omnibus companies, and, in fact, all the companies connected with transportation in London, are gradually reducing their fares.

A. C. S.

RAILROAD MAP OF NEW JERSEY

T. G. Kitchen, of Trenton, has issued a map of New Jersey showing all of the steam and electric railways, freight lines, etc. The map is drawn to the scale of 4½ miles to the inch, and is sold for $1.50 to $2.50, the higher priced map having the counties printed in colors.

PARIS LETTER

(From Our Regular Correspondent.)

Paris, July 21, 1906.

The Union des Tramways de France (French Street Railway Association) has now taken definite shape and a permanent committee has been appointed under the presidency of M. Boulanger, who is president also of the Paris General Omnibus Company. The membership includes representatives from all the Paris traction companies, those of the suburbs and also a selection from the provinces. The offices of the union are at 15 Rue de Madrid, Paris, and the secretary is M. Coste. The objects of the association are, of course, the protection of tramway interests in France, the examination of novel schemes and the exchange of views relative to operation, public service, new construction, and generally all that concerns the welfare of the tramway companies. From the membership it may be gaged that the union is a strong one and may have an important influence on the future policy of municipalities and public authorities inclined to impose stringent regulations upon this or that branch of the industry.

The consideration of the reorganization of public traction in the streets of Paris, although shelved for the moment, is no nearer a solution than ever. The situation is becoming more and more acute as the term of the franchises becomes short, and the authorities may well find themselves in the same dilemma with their traction situation as exists at present with the public lighting. Proposals have been made to cut off the tramway franchise from the General Omnibus Company's franchise, but this has been coldly received by the Omnibus Company, this being one of the most lucrative parts of its services.

On account of the extended tunneling operations beneath the Seine, for the various lines of the Paris Metropolitan Railway, the Prefect of the Seine decided to obtain the opinion of a committee appointed to consider the hygienic conditions of the workmen in the compressed air locks. To this end a commission, composed of Drs. Armand Gautier, Roux, Haller and Walckemaer, was appointed early in the year. The report of this committee has been presented to the Academy of Medicine and contains the following conclusions:

1. That so long as work in the compressed air is done as at present under a pressure less than 2 kg per square cm (28.44 lbs. per square inch) above surrounding air pressure, the duration of work may be the same for the workmen as for work in the open air.

2. It would be an advantage from the standpoint of the health of the workmen that they be submitted but once during 24 hours to the change of pressure necessitated by work in the caissons. The duration of work should be a maximum of 10 hours consecutively, including time of entering and leaving the caissons.

3. In case it should be necessary for a workman to start work twice within 24 hours, a complete repose of 8 hours at least is necessary between such starts. In any case, overwork and accidents can only be avoided by the observance of the following rules:

4. Medical inspection, periodical and frequent, is essential to verify the physical ability of the men for work in compressed air.

5. The duration of the period of entrance and exit from the workings by stages should not be less than five minutes per kg pressure per square cm (14.22 lbs. per square inch).

6. The exit from the pressure should always be long and progressive, and precautions should be taken that the pressure should not be completely changed in less than four minutes, by means of a special tap for this purpose. An experienced and responsible man should be appointed for carrying out the duty connected with the change of pressure.

7. In each caisson a medical post should be established for immediate needs.

In view of the importance of these recommendations, which are issued by the best medical men in Paris, it is highly probable that they will be accepted in their entirety for the compressed air workings beneath the Seine.

Rumors are current of the sale of both the California Street Cable Railroad Company and the Presidio & Ferries Railroad Companies of San Francisco. Both properties are not in the best of condition on account of the damage by earthquake and fire. In addition, the application of the Presidio & Ferries road to the Board of Supervisors to run the road by electric power has been hung up, and the prospects of that company are therefore not very promising, since its franchise has only a few years to run.

STREET RAILWAY ASSESSMENTS IN CHICAGO

The Chicago board of tax review has failed to act in response to the plea of Corporation Counsel Lewis that higher assessments be made against the street railway companies. The Union Traction Company's personality was reduced from $10,925,000, the valuation of the assessors, to $8,484,809 as scheduled by the officials of the company, while the Consolidated Traction Company's schedule of $1,763,195 was accepted instead of the valuation appraised by the assessors at $3,501,096. The valuation of $9,425,000 placed by the assessors on the personality of the Chicago City Railway Company was confirmed, in spite of the demands of the representatives of that company that the valuation be reduced to $8,000,000, on which it paid taxes last year.

FINAL REPORT ON APPLEYARD LINES

B. R. Cowen, special master commissioner in the foreclosure proceedings against the Appleyard system of traction lines, which were sold by the commissioner last February, has filed his final reports winding up the affairs of four of the five lines of this system. Report of the Urbana-Bellefontaine Railway states that the property was sold for $175,000. Receipts have been filed with the commissioner on claims aggregating $526,397. The greatest creditor is the New York Trust Company, which has a claim of $500,000. The report of the Columbus, London & Springfield shows that the property was sold for $240,500. Preferred claims aggregate $12,964; general claims, $766,856; claims disallowed $2,128,000. Among the latter were claims for $499,800 by Frank W. Rollin, Arthur K. Hunt and others, of Philadelphia, and that of Adkins & Company, of Boston, for $122,700. The report of the Columbus, Grove City & Southwestern, shows that the property sold at $35,000; the preferred claims aggregating $520,000; general claims, $133,000, and those disallowed, $250,123. The report of the Central Market Street Railway, of Columbus, shows that the property was bid in for $150,000; preferred claims amounting to $6,639; general claims, $290,048; disallowed, $527,402.

WAGE INCREASE IN PORTLAND, OREGON

An increase in wages that has been granted by the Portland Railway Company to all the car men in its employ puts Portland second highest of all coast cities, including Spokane, with the exception of San Francisco and Oakland, in the wages paid to similar labor. The increase amounts to an average of 1 cent an hour and affects about 600 employees. The new schedule became effective July 1.

The latest increase is one of a number of similar increases since ten years ago when all city roads were paying 16⅔ cents an hour to car men. The wages just announced are about 50 per cent more than trolley car operators realized at that time. First an increase to 18 cents an hour was made by the companies in this city; then to 20 cents and a little later a sliding scale was announced running from 20 cents for new men to 22½ to those who had been in the employ of the road for some time. Finally, about two years ago, an increase to 21 cents as the minimum wage and 25 cents as the highest was announced, which has since been in effect, although a temporary increase was allowed during the Exposition. All these increases have been voluntary on the part of the company. The latest was the result of a petition from a number of the car men, made early in May. The petition set forth the increased cost of living, and asked that wages paid to the men be raised accordingly.

The new scale is as follows, depending on length of service with the company: Twenty-one cents an hour for the first six months; 22 cents an hour for the second half-year; 23 cents for the third; 24 cents for the fourth; 25 cents for the third year; 26 cents for the fourth year and including the tenth year of service, after which the men will be paid 27 cents. The wages of conductors and motormen are the same.

The new salary list is an average increase of 1 cent an hour. For the first six months there is no increase in the wages paid, for the second six months the increase is 1 cent, for the next six months it is half a cent, while for the next six months it is 1½ cents. After the tenth year of service the increase over the present wage is 2 cents.

THE CLEVELAND TRACTION FIGHT

Events of importance in the street railway situation have been following one another with great rapidity in Cleveland during the past week. On July 24 Mayor Johnson and the Board of Public Works, with a large force of city employees, made a grandstand play by tearing up the tracks of the Cleveland Electric Railway on Fulton Road to make room for the tracks of the Forest City Railway Company, the Mayor's low-fare company. Surrounded by half the police force and with detectives mounted on bicycles scouting the neighborhood looking for imaginary enemies, the city pulled up a quarter of a mile of track in record-breaking time. The rails were welded into one solid strip, and the manner of pulling up the track looked like the pictures one sees in old histories of the way Gen. Sherman pulled up the railroad tracks on his famous march to the sea. A big gang of men would raise one side with jacks and then the whole crew would tip over several hundred yards of track, sawing it up with hack-saws after it had been thrown over.

TEARING UP THE TRACK ON FULTON STREET

Mayor Johnson was asked by the Street Railway Journal representative for his authority for taking such action, and he replied that the original franchise to the company provided that the city should locate the track, which it did at that time in the center of the street. Two months ago the city granted a franchise to the Forest City Railway Company for a single-track line at one side of the street and it ordered the old company to move its tracks to the other side. The company denying that the city had the right to make it change after the track had once been placed, paid no attention to the order. Instead of having recourse to the courts to decide the question, the Mayor took the matter in his own hands with the results mentioned. The matter of the expiration of franchise on this street did not enter into the controversy.

The Cleveland Electric Railway Company, upon hearing of the action, immediately applied for an injunction, and notice of a temporary restraining order was issued to the city authorities engaged in the work at 11:18 a. m. Instead of obeying the order, the Mayor made a joke of the matter, pretending that the order did not state specifically what he was restrained from doing. He said he thought probably the order restrained the men from eating their dinner, and ordered them not to stop, the work being continued until late in the afternoon, by which time all the track on the street had been pulled up. Immediately thereafter the Forest City Company commenced laying its track. Work had not progressed very far when the court issued another order commanding all work on the street to stop and ordering the Mayor and director of public works to appear to show reason why they were not in contempt of court. The hearing was held on Tuesday morning, and the case was laid over for one week to permit the city authorities to prepare their side of the case. The city attempted to show that the injunction had been obtained under false representation and that the Cleveland Electric Railway officials should be charged with contempt.

As stated in the last issue, the Cleveland Electric Railway has submitted a proposition offering a reduction in fare to seven tickets for a quarter with universal transfers, the building of several new lines and the building of subways or elevated structures as the city might direct in return for a twenty-five-year extension. The company asked that the matter be submitted to a popular vote of the people and offered to pay the cost of the election.

The Municipal Traction Company, which is supposed to have leased the Forest City Company, has come out with a proposition which it placed in a parallel column with that of the other company, asking that it also be submitted to a vote of the people. In brief, it offers the following: Three-cent cash and ticket fare; universal transfers under Council regulation; revocable grants; franchises to be terminated at any time; Council to have full power of regulating service under penalty of revoking franchises; extensions left to discretion of city; subways and elevateds to be built whenever Council directs, and at a three-cent fare; road to be capitalized at $50,000 per mile and but 6 per cent dividends to be paid, balance going to bettering the service; city ownership whenever desired by the people and permitted by the Legislature; title to the streets to remain absolutely in control of the city for all time; books to be open to all who may care to examine them; submission to vote of the people of any question at any time.

THE DIRECTOR OF PUBLIC SERVICE ACCEPTING THE RESTRAINING ORDER

The Cleveland Electric Railway Company has entirely changed its policy relative to publicity, and has secured the services of H. T. Newcomb, of Washington, D. C., an expert on street railway matters, who will assist the company in placing its proposition before the public. This campaign of education has been started in the daily press, the company having announced that it

has purchased large spaces in the leading daily papers, through which mediums it will state its position. One of the first of the "Street Railway Talks" is in part as follows:

"The Cleveland Electric Railway Company is a Cleveland enterprise owned and operated by Cleveland people, who are bound up with the interest, progress and development of the city. The street railway business, more than any other, depends for its success upon the prosperity of the community served. At the same time the prosperity of any city requires the best possible street railway service. You must see that its own interests force a street railway company to give the best possible service for the lowest fare possible. Cleveland needs increased rapid transit facilities, elevated or subway lines for travel at high speed and many extensions of existing lines. All these the company is ready to supply and is ready to reduce the rate of fare to 3½ cents, continuing the present free transfer system and extending it to new lines to be constructed. On its part it asks the city merely to extend its franchises for the short period of twenty-five years from the expiration of grants now in force. The proposed fare is lower than has ever been offered to any city anywhere near Cleveland's size.

"It will cover a trip of 19 miles from Rocky River to Euclid Beach, or one of any possible length from any point to any other point in the city or its suburbs. With the building of extensions and subways, the growth of Cleveland will begin at once. On the other hand, refusal to accept this company's offer and the acceptance of the Forest City Company's offer will mean but the beginning of years of confusion involving many impediments to Cleveland's tranquility and progress.

"Think it over. If you approve the acceptance of the offer of the Cleveland Electric Railway Company and the immediate settlement of street railway questions, we solicit your active support."

Another statement places the two propositions together in an interesting manner in parallel columns, as follows:

CLEVELAND ELECTRIC RY.	FOREST CITY RAILWAY
Lines cover entire city and all suburbs now.	One line distant from and not now reaching the center of the city.
RATE OF FARE	
Three and one-half cents now.	Three cents, some time, perhaps.
TRANSFERS	
Universal, as at present, from any point to any other point in city or suburbs for one fare now.	Limited to its system and by city boundaries.
SERVICE	
Highest quality. Number of cars in use now 855.	Unknown. Number of cars ordered, 24.
EXTENSIONS	
Whenever and wherever needed as fast as the Council will permit.	No trunk lines from which to extend.
SUBWAYS OR ELEVATED	
At once if Council will permit.	Perhaps, some time, if and when capital can be secured.
CAPITAL	
Sufficient to guarantee that all promises will be kept.	Insufficient or not in sight. Responsibility for large undertaking not shown.
DIVIDENDS AND PROFITS	
Reasonable if they can be earned through good service and economical management.	Guaranteed by a paper company of $10,000 capital at the rate of 6⅔ per cent of the amount paid on stock.
POPULAR VOTE	
To settle, and honestly settle, the traction question on most favorable terms to the city now.	To mark the commencement of a period of greater uncertainty and confusion than any American city, except Chicago, has ever known.
FINALITY OF SETTLEMENT	
Obtained, so far as the laws of Ohio will permit, now.	Impossible until the grants of the Cleveland Electric Railway expire, an average time of eight years, running in some cases beyond twenty years.

RELATIONS TO THE CITY GOVERNMENT	
Free from corrupting influences.	A dangerous and vicious partnership between business and politics that would soon debauch both.
SAVING TO THE PEOPLE	
One million dollars or more annually now. From $8,000,000 to $12,000,000 before the existing grants expire.	Nothing until present franchises of the Cleveland Electric Railway Company expire.

THE CLEVELAND ELECTRIC RAILWAY COMPANY,
By HORACE E. ANDREWS, President.

Not satisfied with the present strenuous fight, the city authorities are making it unpleasant for the company by many petty annoyances in other directions. Director Springborn, of the board of public service, has ordered the company to tear up a large piece of new track on Jennings Avenue, because the sand used in grouting the pavement between the tracks was not sifted to the consistency demanded. This was not "discovered," however, until a long section of track had been relaid.

The neighboring village of Newburg, at the instigation of Mayor Tom, has demanded that the old company immediately commence laying track on a street where a franchise has recently been granted, under penalty of having the franchise revoked and turned over to the Forest City Company. This in spite of the fact that the authorities are well aware that the company cannot secure the rails for some little time to come.

Under the attacks of the city, the stock of the Cleveland Electric Company declined last week from 74½ to 66, but strengthened at the end of the week to 70. It is believed that this was caused largely by manipulation, as the insiders are not selling. The proposition made by Henry Everett to lease the Cleveland Electric Railway is said to have been declared off, Mr. Everett being unwilling, it is understood, to attempt to guarantee payment of dividends on a basis of seven tickets for a quarter.

A new tangle has been created by the announcement of Frank DeHaas Robinson, who was formerly prominent in the street railway business in Cleveland, that he would bid against the Municipal Traction Company on a 3-cent fare basis. He would not accept a franchise which would be terminable at any time, however.

STRIKE IN NEW BEDFORD

Since July 24 the car men of the Union Street Railway Company have been on strike. There were a number of riotous demonstrations on the first day, but since then the police have been able to prevent further violence. The dispute between the company and its employees is due to the refusal of the former to make an agreement with the Amalgamated Association of Street Railway Employees which would virtually have put that organization in the position of controlling the management of the railway. There was no real dispute as to wages—in fact the company has promulgated a wage schedule which will enable car men to attain the maximum wage of 25 cents an hour in five years, instead of fourteen years as formerly. After a tripartite conference on July 26 between the State Board of Arbitration, President Crapo, of the Union Street Railway Company, and representatives of the strikers, the latter voted to remain on strike.

At the present writing the company has succeeded in securing a number of outside men, and cars are running as regularly as usual.

The New Hampshire Electric Railways recently entertained over one hundred members of the Suburban Press Association, at Canobie Lake Park. The party left Boston eary in the morning over the Boston & Maine Railroad and were met at Hampton by Superintendent Hayden, where they were taken by trolley cars to Hampton Beach. Here they were met by Robert H. Derrah, advertising agent of the company, and Col. W. H. Phinney, manager of the Casino, theatre, hotels, etc. In the afternoon they visited the Canobie Lake Park, where they were met by Mr. Williams, superintendent of the park, and where they were entertained at dinner. Late in the afternoon they were given a trolley ride to Lawrence, from which place they returned to Boston on a special car.

MAP SHOWING PROGRESS OF INDIANA INTERURBAN LINES

The progress during the last six months of the interurban industry in Indiana is illustrated by a map, showing all the traction lines in operation and under construction in this State, just issued by the American Engineering Company, of Indianapolis. Compared with a similar map issued by the same company six months ago, the new map shows that 220 miles of electric road have been put into operation since Jan. 1, and that construction work has been begun on almost 400 miles additional.

The new lines which have begun operations since the first of the year are the Winona Interurban Company, between Goshen and Winona; the Toledo & Chicago Interurban Railway, from Waterloo to Auburn and from Garrett to Ft. Wayne; the Marion, Bluffton & Eastern, from Ft. Wayne to Bluffton; the Muncie & Portland, from Muncie to Portland; the Terre Haute Traction Company, from Farmersburg to Sullivan; the Evansville & Mt. Vernon Traction Company, from Evansville to Mt. Vernon; the Evansville, Suburban & Newburg, from Evansville to Boonville and from Evansville to Newburg; the Ft. Wayne & Springfield Railway, from Ft. Wayne to Decatur, and the Indianapolis & Western, which will be running cars from Indianapolis to Danville within a few weeks.

The lines upon which construction has started since Jan. 1 are the Winona Interurban, from Warsaw to Peru; the Ft. Wayne & Wabash Valley, from Logansport to Lafayette; the Indianapolis, Crawfordsville & Western, from Indianapolis to Crawfordsville; the Evansville & Princeton, from Princeton to Vincennes; the Indianapolis, Columbus & Southern, from Columbus to Seymour; the Indianapolis & Louisville, from Seymour to Sellersburg; the Indianapolis & Cincinnati, from Rushville to Connersville, and from Shelbyville to Greensburg; the Evansville & Eastern, connecting at Newburg for Rockport and Grand View; the Indianapolis, Newcastle & Toledo, from Indianapolis to Maxwell, from Maxwell to Greenfield, from Greenfield to Shirley, from Shirley to Anderson, and to NNewcastle, and from Newcastle to Muncie, to Winchester and to Richmond.

Traction lines that will be put in operation during the next six months are given as follows: The Northern Indiana, from South Bend to Laporte; the St .Joseph Valley, from Lagrange to Angola; the Toledo & Chicago Interurban Railway, from Garrett to Kendallville; the Marion, Bluffton & Eastern, from Bluffton to Marion; the Indianapolis, Crawfordsville & Western, from Indianapolis to Crawfordsville; the Indianapolis & Western, from Plainfield to Brazil, and the Indianapolis & Cincinnati, from Rushville to Connersville, and from Shelbyville to Greensburg.

Lines projected that probably will be placed under construction before the beginning of the coming year are the Indianapolis, Huntington & Columbus City; one from Lafayette to New Albany, by way of Crawfordsville, Greencastle, Spencer, Bloomington, Bedford and Salem; one connecting French Lick, Paoli, Salem, Scottsburg, Madison, Aurora and Cincinnati, and three lines out of Vincennes, one to Sullivan, another to Washington, and a third to Petersburg and Jasper.

NEW PUBLICATIONS

"Carbon Brushes, a Practical Treatise," by J. S. Speer. Published by the Speer Carbon Company, St. Marys, Pa. Cloth, 30 pages.

Mr. Speer is a well recognized authority on the subject of carbon brushes and his little book contains a very interesting discussion of the proper qualities of a brush and methods of using it. Among other points Mr. Speer expresses himself strongly against the idea that a high voltage motor requires a high resistance carbon, and vice versa. He states that the terminal voltage of the machine does not play a very important part in determining the quality of the carbon brush to be used. One of the prime requisites of a good brush is that it shall contain in its composition ingredients that render it of suitable resistance to limit the cross-currents in the short-circuited coil or coils which are undergoing commutation, and also that it should wear off the mica and copper over which it rides at an equal rate. It should also contain enough lubricating material to polish the commutator surface. In other words, a successful carbon brush must have resistance, cutting anl lubricating qualities, each in due proportion. The practice of lubricating the commutator is gradually being superseded by placing the lubricant in the brush itself, and the author quotes some very interesting examples showing how direct lubrication of the commutator has been discontinued with very satisfactory results. The results of some tests are given showing temperature of brush according to amperes per square inch of brush contact, wattage loss in terms of peripheral speed of commutator, voltage drop in terms of amperes per square inch of brush contact, etc. Some interesting views and particulars are also given concerning contact devices for carbon brushes. The book is written primarily to bring out the favorable features of the Speer carbon brush, but also contains a great many valuable hints on the use of brushes.

PERSONAL MENTION

MR. C. O. SIMPSON has tendered his resignation as general manager of the Little Rock Railway & Electric Company. Mr. Simpson has been elected vice-president of the Citizens' Savings Bank & Trust Company, of Birmingham, Ala., his former home, and as soon as he is relieved he will return to the Alabama city, to accept this position.

MR. CHARLES A. BRAGG, manager of the Philadelphia office of the Westinghouse Electric & Manufacturing Company, died Saturday evening, July 28. Mr. Bragg was one of the oldest members of the Westinghouse staff, having become connected with the organization in 1887. The funeral was held on Monday afternoon from his late residence, 4111 Locust Street, Philadelphia.

MR. EDGAR JAY RAUCH, of Newark, Ohio, has been appointed general superintendent of the Saginaw-Bay City Railway & Light Company, to succeed Mr. J. C. Young, resigned. Mr. Frank Gavigan, of Saginaw, becomes superintendent of electrical properties for the company. Mr. Rauch was formerly superintendent of the interurban system connecting Columbus, Newark and Zanesville. He assumes his duties at once.

MR. J. C. ROSS, who recently resigned as general manager of the Steubenville Traction & Light Company, was the recipient of a surprise party a few night ago, tendered him by his former associates. Mr. Ross was presented with an elegant solid silver loving cup, of beautiful design, as a token of the esteem of his coterie of friends. Mr. Ross has been appointed general manager of the Utah Light & Power Company, of Salt Lake City, Utah.

MR. HARRY B. IVERS, treasurer and general manager of the Pawcatuck Valley Street Railway and the electric lighting companies in Westerly and Mystic, sent his resignation to the board of directors, to take effect July 31. Mr. Ivers resigned his position for the purpose of entering into a partnership with Philip H. Farley, of Boston, a banker, and president of the Midford Electric Light Company, of Midford, N. H. The new company will be known as Farley, Ivers & Company, and will build and deal in the securities of lighting plants and electric railways.

MR. W. B. TARKINGTON, whose resignation as superintendent of the Detroit, Monroe & Toledo Short Line was announced in the Street Railway Journal of July 14, has become superintendent of transportation of the Milwaukee Electric Light & Railway Company. Mr. Tarkington's excellent work for the Short Line made his departure one regretted by the personnel of the company and its patrons. As a token of their good feeling the employees gave a surprise party to their retiring chief and presented him with a silver loving cup. Mrs. and Miss Tarkington were also honored with a bouquet and bon-bons, respectively.

MR. J. L. ADAMS, general manager of the Indiana, Columbus & Eastern lines, west of Columbus, has announced several changes in the operating force. Mr. B. M. Brown, heretofore superintendent of the roads out of Columbus, has been transferred to Dayton, as superintendent of the Dayton & Richland, and Dayton & Union City divisions. Mr. Walter Hurst has been appointed general passenger and freight agent of the system, and Mr. N. A. Thomson has been appointed soliciting passenger and freight agent for the lines of the company in Columbus, while Mr. C. O. Baker will have a similar position for the roads of the system entering Dayton.

COLONEL ALVA J. SMITH, general passenger and ticket agent of the Lake Shore & Michigan Southern Railway, died July 26, at Harriettstown, N. Y., in the Adirondack Mountains, where he was taken from Cleveland several weeks ago with the hope of saving his life. Mr. Smith was 66 years of age. An attack of pneumonia early this spring was followed by an abscess on the lungs, which was the direct cause of death. Mr. Smith began his railway career in 1866 as a clerk in the general offices of the Cleveland, Columbus & Cincinnati Railway Company. He rose rapidly in the ranks and was finally made general passenger agent of the road. In 1888 he was appointed general passenger and ticket agent of the Lake Shore road.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O. Northern Ohio Tr. & Light Co	1 m., June '06	92,984	48,895	44,089	22,738	21,352
	1 " " '05	85,163	45,841	39,322	23,017	16,305
	6 " " '06	461,056	257,473	203,583	136,072	67,512
	6 " " '05	425,478	236,918	188,561	137,602	50,960
BINGHAMTON, N. Y. Binghamton Ry. Co.	1 m. June '06	30,252	14,147	16,106	7,423	8,682
	1 " " '05	26,226	11,961	14,265	7,207	7,058
	12 " " '06	291,943	150,889	141,054	87,790	53,263
	12 " " '05	261,124	136,862	124,262	84,491	39,771
BOSTON, MASS. Boston & Worcester St. Ry. Co	1 m., June '06	49,758	29,251	20,507	------	------
	1 " " '05	45,508	26,077	19,431	------	------
	9 " " '06	323,000	215,787	107,213	------	------
	9 " " '05	280,699	200,356	80,343	------	------
CHAMPAIGN, ILL. Illinois Traction Co.	1 m., June '06	236,868	*132,758	104,111	------	------
	1 " " '05	189,083	*101,866	87,216	------	------
	6 " " '06	1,344,830	*766,995	577,835	------	------
	6 " " '05	1,094,713	*608,130	486,583	------	------
CHARLESTON, S. C. Charleston Cons. Ry. Gas & Elec. Co	1 m., June '06	55,612	32,144	23,468	13,017	19,452
	1 " " '05	53,572	29,964	23,608	13,167	10,441
	4 " " '06	210,487	128,144	82,343	51,917	30,426
	4 " " '05	196,553	116 693	79,860	51,917	27,944
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co	1 m., May '06	102,533	55,730	46,803	24,939	21,864
	1 " " '05	91,730	49,966	41,764	24,313	17,451
	2 " " '06	192,514	107,479	85,035	49,878	35,157
	2 " " '05	171,598	97,380	74,218	49,232	24,986
Chicago & Milwaukee Elec. R. R. Co	1 m. June, '06	84,555	27,255	57,300	------	------
	1 " " '05	53,218	22,266	30,952	------	------
	6 " " '06	331,823	143,793	188,080	------	------
	6 " " 05	211,973	104,017	107,957	------	------
CLEVELAND, O. Cleveland, Painesville & Eastern R.R. Co	1 m., June '06	27,257	*14,247	13,011	------	------
	1 " " '05	23,941	*13,200	10,741	------	------
	6 " " '06	113,888	*66,102	47,786	------	------
	6 " " '05	99,416	*63,147	36,270	------	------
Cleveland & Southwestern Traction Co.	1 m., June '06	48,558	26,930	21,628	------	------
	1 " " '05	59,058	31,777	27,281	------	------
	6 " " '06	237,376	148,892	88,483	------	------
	6 " " '05	289,277	173,160	116,117	------	------
Lake Shore Electric	1 m., May '06	67,793	*40,908	26,885	20,404	6,481
	1 " " '05	61,587	*37,392	24,195	20,404	3,790
	5 " " '06	300,210	*184,515	115,695	102,021	13,674
	5 " " '05	258,660	*160,689	97,971	102,021	†4,049
DETROIT, MICH. Detroit United Ry	1 m., June '06	525,957	*303,486	222,471	95,154	127,317
	1 " " '05	461,522	*266,530	194,992	93,364	101,628
	6 " " '06	2,678,336	*1609823	1,068,513	564,176	504,337
	6 " " '05	2,345,977	*1434023	911,954	553,924	258,080
DULUTH, MINN. Duluth St. Ry. Co	1 m., May '06	63,884	33,020	30 864	17,513	13,352
	1 " " '05	54,501	28,832	25,669	16,811	8,859
	5 " " '06	289,238	162,210	127,029	87,519	39,509
	5 " " '05	249,286	139,090	110,196	83,753	26,444
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co	1 m., May '06	94,790	46,992	47,798	------	------
	1 " " '05	93,729	38,467	55,262	------	------
	5 " " '06	422,465	230,367	192,098	------	------
	5 " " '05	398,076	189,187	208,889	------	------
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co	1 m., May '06	87,327	55,847	31,480	------	------
	1 " " '05	74,062	46,031	28,031	------	------
	5 " " '06	398,958	250,526	148,432	------	------
	5 " " '05	340,657	214,260	126,397	------	------
FT. WORTH, TEX. Northern Texas Tr. Co	1 m., May '06	71,485	*42,695	28,790	9 942	18,848
	1 " " '05	57,080	*30,966	26 114	10,326	15,787
	12 " " '06	720,553	*440,259	280,294	119,660	160,634
	12 " " '05	597,721	*346,606	251,115	111,946	139,169
GALVESTON, TEX. Galveston Elec. Co	1 m., May '06	27,721	*16,520	11,201	4,166	7,035
	1 " " '05	22,252	*14,109	8,143	4,167	3,976
	5 " " '06	107 296	*74,148	33,148	20,833	12,315
	5 " " '05	95,974	------	------	------	------
GREENSBURG, PA. Pittsburg, McKeesport & Greensburg Ry. Co.	1 m., June '06	22,798	10,742	12,056	4,442	7,614
	1 " " 05	17,701	9,277	8,424	------	------
	6 " " '06	96,483	57,168	39,315	23,359	15,956
	6 " " '05	77,905	48,504	29,401	------	------
HANCOCK, MICH. Houghton County St. Ry. Co	1 m., May '06	18,212	*11,500	6,713	3,966	2,747
	1 " " '05	10,993	*11,698	†699	3,627	†4,326
	12 " " '06	205,679	*144,334	61,345	45,642	15,703
	12 " " '05	167,861	*160,309	7,552	41,452	†33,900
HOUSTON, TEX. Houston Electric Co.	1 m., May '06	49,176	*29,624	19,553	7,692	11,861
	1 " " '05	43,636	*27,228	16,408	8,907	7,501
	12 " " '06	551 997	*341,837	210,161	101,331	108,829
	12 " " '05	394,327	*328,985	65,342	106,768	†35,425
LEECHBURG, PA. Pittsburg & Alleghany Valley Ry. Co.	1 m., June '06	4,463	2,181	2,333	2,165	167
MANILA, P. I. Manila Elec. R. R. & Lt. Co., Railway Dept	1 m., June '06	43,250	21,750	21,500	------	------
	6 " " '06	262,080	131,235	130,846	------	------
Total, all depts	1 " " 06	73,750	35,750	38,000	------	------
	6 " " '06	440,035	222,428	217,609	------	------
MILWAUKEE, WIS. Milwaukee El. Ry. & Lt. Co.	1 m., June '06	300,794	146,401	154,393	76,994	77,399
	1 " " '05	280,856	133,318	147,538	79,041	68,497
	6 " " '06	1,671,660	840,212	831,448	514,405	317,043
	6 " " '05	1,551,692	782,435	769,256	450,749	318,508
Milwaukee Lt., Ht. & Tr. Co	1 m., June '06	65,751	24,461	41,290	28,008	13,282
	1 " " '05	55 164	22,525	32,638	21,568	11,070
	6 " " '06	293,241	123,046	170,195	145,962	24,233
	6 " " '05	256,825	122,366	134,459	117,909	16,549
MINNEAPOLIS, MINN. Twin City R. T. Co	1 m., June, '06	484,590	215,543	269,046	110,591	158,454
	1 " " '05	392,528	177,853	214,675	100,875	113,800
	6 " " '06	2,554,608	1,214,382	1,340,226	660,016	680,209
	6 " " '05	2,171,470	1,039,527	1,131,943	587,383	544,559
MONTREAL, CAN. Montreal St. Ry. Co.	1 m., June '06	287,595	152,835	134,760	52,034	82,727
	1 " " '05	248,200	137,594	110,607	29,514	81,093
	9 " " '06	2,193,785	1,367,193	826,592	319,008	507,584
	9 " " '05	1,923,992	1,258,520	665,471	199,168	466,303
NEWBURGH, N. Y. Orange Co. Trac. Co.	1 m., May '06	11,726	7,552	4,174	------	------
	1 " " '05	11,445	6,789	4,656	------	------
	5 " " '06	43,898	34,793	9,105	------	------
	5 " " '05	39,016	31,651	7,365	------	------
NEW ORLEANS, LA. New Orleans Ry. & Lt. Co	1 m., June '06	446,277	261,319	184,958	155,123	29,835
	6 " " '06	2,889,087	1,530,467	1,358,620	916,286	442,334
OAKLAND, CAL. Oakland Trac. Con	1 m., Apr. '06	151,525	67,817	83,709	35,678	48,030
	1 " " '05	122,247	57,003	65,243	------	------
PEEKSKILL, N. Y. Peekskill Lt'g & R.R. Co	1 m., June '06	15,219	7,065	8,154	------	------
	1 " " '05	12,904	6,619	6,285	------	------
	6 " " '06	65,976	35,985	29,991	------	------
	6 " " '05	56,478	34,366	22,112	------	------
PHILADELPHIA, PA. American Rys. Co	1 m., June '06	247,398	------	------	------	------
	1 " " '05	221,206	------	------	------	------
	12 " " '06	2,100,159	------	------	------	------
	12 " " '05	1,871,462	------	------	------	------
ST. LOUIS, MO. United Railways Co. of St. Louis	1 m., June '06	791,402	*483,854	307,548	198,026	109,522
	1 " " '05	746,101	*451,128	294,973	198,840	96,133
	6 " " '06	4,400,267	*2724282	1,675,985	1,189,322	486,663
	6 " " '05	4,046,088	*2699179	1,346,909	1,195,337	151,572
SAVANNAH, GA. Savannah Electric Co.	1 m., May '06	53,174	*30,694	22,480	11,020	11,460
	1 " " '05	50,569	*27,936	22,633	10,554	12,079
	12 " " '06	609,734	*369 463	240,271	129,634	110,637
	12 " " '05	562,297	*322,923	239,374	126,923	112,451
SEATTLE, WASH. Seattle Electric Co	1 m., May '06	243,632	*154,420	89,212	27,380	61,832
	1 " " '05	208,608	*132,775	75,834	24,955	50,879
	12 " " '06	2,739,385	*1764783	974,602	299,524	675,078
	12 " " '05	2,378,040	*1632848	745,192	301,416	443,776
SYRACUSE, N. Y. Syracuse R. T. Co	1 m., June '06	88,990	52,375	36,615	28,247	8,367
	1 " " '05	80,790	46,243	34,546	24 267	10,279
	6 " " '06	517,115	296 574	220,541	165,018	55,522
	6 " " '05	454,010	266,025	187,984	145,716	42,268
TERRE HAUTE, IND. Terre Haute Tr. & Lt. Co	1 m., May '06	60,473	*37,397	23,076	13,642	9,434
	1 " " '05	51,749	*36,143	15,606	10,854	4,752
	12 " " '06	692,720	*437,238	255,482	137,686	117,796
	12 " " '05	588,558	*379,145	209,413	113,654	95,760
TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., May '06	167,847	*93,855	73,992	42,243	31,749
	1 " " '05	154,492	*82,740	71,752	41,894	29,858
	5 " " '06	784,391	*420,494	363,897	211,451	152,446
	5 " " '05	732,567	*382,889	349,678	212,043	137,635

NEWS OF THE WEEK

CONSTRUCTION NOTES

LOS ANGELES, CAL.—A combination of subway and tunnel is the project of the Los Angeles Pacific Railway for securing a line which will enable quick time to be made from this city to the beaches, and will give the company a new outlet to relieve the Sixteenth Street and Hollywood lines. A ravine extending from Vermont Avenue southeasterly to a point about 200 ft. northwest of Sixth Street will be utilized for the subway portion of the new cutoff. The tunnel from Sixth Street to beyond Wilshire will be about 1700 ft. in length, 17 ft. high and about 70 ft. wide.

LOS ANGELES, CAL.—Representatives of H. E. Huntington have secured a right of way through the Wolfskill Ranch, which is adjacent to the Hammel & Denker Ranch, recently purchased by Mr. Huntington and his associates, including several officers of the Associated Oil Company. Both of these properties are in the territory heretofore held exclusively by the Los Angeles Pacific Company. It was denied at the Pacific Electric offices that Mr. Huntington intended to build in that region, but no explanation was offered of why he had secured a right of way. It is of interest to know, also, that Mr. Huntington has ordered the construction of a 3-mile extension of the interurban system of the Sixth Street line. This will begin at the terminus now at Rampart and Sixth Streets and extend west on Sixth, crossing Normandie and Western Avenue, to a point 1320 ft. west of the latter, and thence north to Fourth Street, on a private right of way.

NORWICH, CONN.—Preliminary operations have been begun by the Consolidated Railway Company for the construction of a line from Norwich through Jewett City and Plainville to Central Village. Here connection will be made with the Danielson & Putnam Division. The topography of the country traversed is such that very little grading will be necessary.

NORWICH, CONN.—The Consolidated Railway Company has completed plans for the erection of a large car house in this place. It will be of brick, 150 ft. by 200 ft.. Provision will be made for a repair shop, waiting room and manager's office. The cost of construction and equipment will approximate $100,000.

EDWARDSVILLE, ILL.—The extent of the improvements to the McKinley syndicate's power house in Edwardsville were made known last week at a meeting of the City Council, when it was announced that $100,000 had been set aside for the purpose. The plant will be largely increased to make it an auxiliary sub-station for the running of the interurban lines, and it is said that Edwardsville will be the connecting point for other lines which are in contemplation. The company applied for a franchise to construct another city line in Edwardsville from the city square north along Second Street to the city limits, and it was granted. Work will begin shortly.

COLUMBUS, IND.—The Columbus Street Railway & Light Company is preparing to build a new power plant.

INDIANAPOLIS, IND.—The Indiana Rapid Transit Company, P. M. Dunn, president, is reported to have announced that the bonds have been sold assuring the building of a line from Logansport to Terre Haute, and that bids for the construction of the road would be invited soon.

MARSHALLTOWN, IA.—Hamilton Browne, who has the contract for the construction of an electric line from Marshalltown to Ferguson, at which latter point connections are to be made with the Milwaukee Road, has secured an option on the property of the Marshalltown Electric Light & Gas Company, which operates the street railway system of Marshalltown. Mr. Browne expects to run the street railway system in connection with the interurban line. He states that he will construct an extension to Conrad, Ia., immediately after constructing the line to Ferguson, and that he also expects to extend several city lines as soon as he secures control of the city railway system.

SIOUX CITY, IA.—W. R. Burch, of Chicago, and J. W. Browning, of Kansas City, have been in Sioux City negotiating for the purchase of the Sioux City, Homer & Southern Railway Company, which was constructed from South Sioux City to Dakota City about two years ago by H. H. Talbot. The deal was finally consummated on July 18. The new owners have organized a company under the name of the "Nebraska & Southern Railway Company," and the necessary arrangements for the transfer of the property of the old company to this new one have all been completed. The new owners have agreed to run the road in connection with the Sioux City Traction Company's line to South Sioux City, and the work of connecting the two lines in South Sioux City has already commenced. The two companies have agreed on rates, and, under the new arrangement, the fare from Sioux City to South Sioux City will be 5 cents, and from Sioux City to Dakota City, 10 cents. The Sioux City Traction Company has entered into a contract with the Nebraska & Southern Railway Company to furnish electric power to the said company for a period of twenty-five years. The new company will probably extend the line from Dakota City to Homer within a short time. Homer was the terminus Talbot had in mind when he started the construction of the line, but he was compelled to stop construction work about 1 mile south of Dakota City on account of lack of funds. The line has not been operated since it was constructed. The new company expects to operate cars over the line within thirty days.

HUTCHINSON, KAN.—Work on the electric street railway is progressing satisfactorily to the company. J. P. Shunk was asked how things were progressing from a company standpoint. He said that of the $51,000 subscribed for the stock, about $800 would not be paid, but that most of the rest had been paid in. He was asked what effect it would have on the company should the courts decide the city cannot issue the $20,000 in bonds voted. Mr. Shunk replied that this would for a time prevent the laying of the Fourth Avenue line on out to the packing house, from the Fourth Avenue school building, but that the company had funds enough in sight to lay the Main Street, Avenue F, Avenue A and the Fourth Avenue lines.

LOUISVILLE, KY.—The Louisville, New Albany, French Lick & West Baden Railway Company, which proposes to construct an electric line from New Albany to French Lick and West Baden Springs, purchase the electric line equipment of the Kentucky & Indiana Bridge Company and extend the electric line of the bridge company in Louisville, has applied to the New Albany Board of Public Works for a right of way over a number of the streets of that city. The company is composed of Louisville, New Albany and Southern Indiana capitalists, and, it is claimed, is backed by ample capital to carry out the purposes for which it was organized.

SOMERSET, KY.—Construction has begun on the railway of the Somerset Water, Light & Traction Company. The line will be about 6 miles long.

NEW IBERIA, LA.—The subject of an electric road for New Iberia, and extending to Franklin, is again eliciting much interest. W. P. Conery, of New Orleans, to whom was recently granted a franchise for twenty-five years, is here completing the legal formalities. The City Council held a special session and passed an ordinance unanimously giving Mr. Conery and associates a franchise for the operating of a street railway in this city for twenty-five years. New Iberia will be the center of the system, which will take in the country east to Franklin 25 miles, and west about the same distance.

NEW ORLEANS, LA.—Leigh Carroll, president of the Algiers Electric Railroad Company, has sent a reply to Mayor Behrman with reference to his recent inquiries as to when actual building of the line would begin. Mr. Carroll says that the modified contract provided in the ordinance of June 1, this year, had been prepared and was now awaiting the signature of the surety company, which would be signed, and then the work would be proceeded with. The franchise of the Algiers Electric Railroad Company is for fifty years. The road is to start from the intersection of the Orleans-Jefferson Parish line at Teche Street, along Teche Street to Opelousas Avenue, across Opelousas Avenue to Bouny Street, and thence in a more or less circuitous route to the Mississippi River.

ANNAPOLIS, MD.—The Washington, Baltimore & Annapolis Electric Railway, which is pushing work on its connection between Washington and Baltimore, and will use the line of the old Annapolis, Washigton & Baltimore Railroad for trolley service to Annapolis, now wants to come into Annapolis. Application has been made to the Council for a forty-year franchise granting the road the right to lay tracks and run cars over some of the principal streets of the town. George T. Bishop, president of the road, will appear before the Council and explain fully the request of the corporation and the advantages which a city trolley service would give to Annapolis. The company's present intended terminal is at the station of the Annapolis, Washington & Baltimore Railroad. A bond is offered the municipality to insure that the work will be done and the cars running by Jan. 1, 1908.

BOSTON, MASS.—A syndicate representing financial and manufacturing interests in Massachusetts will petition the Railroad Commissioners in a few days for the right to construct an electric interurban railroad between Beverly and Boston, passing through Salem, Peabody, Lynn, Saugus, Revere and Chelsea. From Peabody a line will be extended to Danvers via Danvers Port. This enterprise has been slowly gathering headway for the last two years, and in the meantime a number of the men interested have labored together with other capitalists and electric railway men in behalf of the new interurban railroad law, which provides for the building of fast electric lines over private land, and which was passed at the late session of the Legislature. The road will be known as the Boston & Eastern Electric Railroad, and is planned to be of the high-speed class, wholly upon private right of way, and will have no grade crossings whatever. All crossing over or under streets will be reinforced concrete arches, and all bridges over other railroads will be of steel, to permit of high speed, if the road is ever built. The road, as planned on paper, is to be double track the entire length, with provisions for four tracks from Lynn to Boston. The branch from Peabody to Danvers is to join the main line in such a way that through trains will be run from Danvers to Boston; and yet the main-line tracks will not be cut, as is usual on steam railroads. Actual surveys have been made, including the taking of levels once in 100 ft., and oftener at some places, of every foot of the line, and plans made of all private property, tide waters and streets that are to be crossed. The new road aims to connect in Boston with the Boston "L," so passengers may go from any point on the line to any part of Boston and to Cambridge (when the new subway to that ciy is built). The promoters say the cars on the Boston & Eastern will run at higher speeds than the trains on the steam railroads running out of Boston, and yet the fares will be considerably lower than those of the steam roads. The men behind the proposed Boston & Eastern are prominent in financial and manufacturing circles. The articles of association contain the names of John H. Bickford, Salem; Arthur Sturgis, Brookline; Harry P. Graves, Lowell; William H. Grove, Salem; George C. Vaughn, Salem; Melville Woodbury, Beverly; William S. Nichols, Salem; Fred A. Norton, Salem; William E. Bixby, Haverhill; John H. Linehan, Beverly; E. Bertram Newton, Boston.

BRIMFIELD, MASS.—The Springfield Street Railway Company has asked the Selectmen of Brimfield for an amended location over highways and private right of way in East Brimsfield.

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Of this issue of the Street Railway Journal, 8000 *copies are printed. Total circulation for* 1906 *to date,* 261,600 *copies, an average of* 8175 *copies per week.*

Welfare Work in Power Stations

One of the most interesting phases of modern industrialism is the increasing attention paid by large establishments to so-called welfare work, for the betterment of the conditions under which the employees labor. Activities of this kind are in no sense confined to the rank and file of employees, but are in many instances broadly beneficial to even department heads. In electric railway circles a great deal has been done along this line to improve the living conditions of employees directly occupied in the handling of cars; companies have fostered esprit de corps and strengthened many a motorman and conductor's position in life by liberal contributions to benefit associations, by supplying various necessities at less than cost, etc. Sometimes the power plant has been overlooked in these commendable activities, and it is the purpose of these comments to point out several ways in which welfare work can be extended to this part of the system.

In far too many plants the chief engineers are unprovided with any sort of office facilities worthy of the name. Of course, a power house is no place for mahogany desks, Turkish rugs and Louis Quinze chairs, but where a man is obliged to prepare careful and regular records of the power cost in detail, something in advance of a nail keg or an oil barrel is sure to be appreciated in lieu of a handsome desk. Again, power houses are sometimes lacking in anything but the most elementary sixteenth century sanitary facilities; lockers are conspicuous by their absence; or there is no place where an engineer or fireman can wash himself and then enjoy a meal which has to be taken when on duty. The provision of hot water for this purpose, a mirror and a few brushes are certainly appreciated by deserving men, and cost little from the company's standpoint. Power plant attendants are not averse to good personal appearance on the way home from work, any more than are the draftsmen in the main office. Another point is worth securing: the provision of enough men so that each power house attendant can take a day off once in seven or eight days, instead of being hemmed in to continuous service all the year round. Bonuses for reduced cost of power generation are helpful in some plants, and promotions from within when capable men for advancement can be secured from the company's own force are usually much appreciated by employees of the right sort. One or two technical journals supplied by the company ought to be available at the power house for all employees, and all reasonable encouragement should be given to power-house men engaged in night duty or outside efforts of any kind to become more efficient workers. It is in no carping spirit that we mention these points, but in many plants the working conditions may be improved by very simple and inexpensive methods.

Better Use Air Brakes

We publish this week an article from Europe strongly advocating the use of shunt-wound traction motors with regenerative control, and incidentally the bow trolley. The text of the author's preachment is the series of recent English accidents ascribed to the hand brake with magnetic brake as a reserve. If our American experience teaches anything it is that hand brakes should not be used except for light cars at low speeds, and that emergency brakes of any kind as auxiliary to hand brakes are inferior to first-class power brakes in regular use, and hence in regularly good condition. Motor braking as a feature of regenerative control is all very well if

the motor circuit is intact. It is, however, in no wise more efficient in stopping the car than properly designed air brakes, and far less simple. The most that any brake can do is to put the pressure on the wheels just short of the sliding point, and this is well within the power of air brakes, particularly when they are in steady use and the motorman is familiar with them. Reversal of the motors is the only emergency procedure of much value, and this can be done as readily with series as with shunt motors. If it is necessary to provide extreme braking power there is more to be said for the track brake than any other, but from all the braking tests which have been made the indications are that powerful air brakes will on the average stop a car as promptly as anything that has been yet devised, with the advantage that they are steadily used, so that their effect is perfectly understood. If magnetic brakes are preferred they are available, in very efficient form, including the track brake, without recourse to the intricacies of regenerative control.

If such control be used, it goes without saying that the trolley must not jump the wire. There have been many improvements in trolley wheels, and more particularly in overhead work, so that the ancient jibe of "Drop a nickel in the slot and see the trolley come off" has lost its force. City roads and even interurban roads are using the wheel trolley with excellent results, and at a cost for renewals amounting to only a small fraction of the dollar for 5000 miles cited by Mr. Hooghwinkel. Nevertheless for high speeds and heavy currents there is considerable to be said for some kind of sliding contact, which cannot come off and which will take currents of considerable size, and this phase of the subject is discussed in the following editorial. We hardly think, however, that any future sliding contact will bring shunt motors and regenerative control with it. The present series motor leaves little to be desired in simplicity and reliability. It gives a wide range of efficient control, has immense torque, and is simple and cheap to wind. Although inter-pole construction has given a new flexibility to shunt motors, they have, unless for regenerated control, no points of advantage sufficient to warrant a change. In the few foreign roads in which such control has been used the results have been, we believe, fairly satisfactory. We have yet to see any results that indicate a net saving in energy considerable enough to form a valid argument for the increase in complexity. The device is an old one, tried, like the shunt motor itself, at many times and in many places. The growth of the art has been in another direction, toward simplicity and the development of a robust operating equipment capable of hard service under all conditions. Up to the present, the shunt equipment has seemed too tender for adoption.

Current Collectors for High-Speed Roads

At present the only satisfactory method of collecting large currents at high speeds is from a third rail. By large currents and high speeds is meant the collection of more than 250 amps. at 50 m. p. h. Up to this point the ordinary trolley wheel, well balanced, bearing against a catenary-hung trolley, is fairly satisfactory. The life of a trolley wheel varies, of course, with the alignment of track and overhead construction, tension on the pole, conditions of bearings and other factors, but under ordinary conditions the average life of a trolley wheel in high-speed service is about 3000 miles. A trolley wheel will collect as high as 800 amps. at speeds below 15 m. p. h., that is, while cars are starting, but its ability as a current collector decreases with the speed until from 200 to 250 amps. is about the limit of its capacity at 50 m. p. h. These values are based upon a pressure of about 35 lbs. upward thrust.

The limit of wheel capacity comes almost entirely from two causes: (1) The inertia of the wheel when striking trolley-wire supports, which, however light and flexibly suspended they may be, still make the wheels jump at speeds approaching or exceeding 50 m. p. h.; (2) It takes only a slight unbalancing of the wheels at these high speeds to produce almost continuous arcing and hence rapid deterioration of the wheels. The remedy for this, of course, is better construction of the wheels, proper balancing, frequent inspection and turning down, and larger diameters. Tests made with trolley wheels under 18 lbs. pressure between wheels and wire indicate that with a No. 00 wire and 12-ft. pole, and at 10 m. p. h., there is a drop of about 2 volts at 500 amps., or 1 kw is lost. This drop increases rapidly with the speed, so that at 50 m. p. h. the drop averages between 13 and 14 volts. At 60 m. p. h. or more the trolley wheel becomes almost inoperative with present line construction and diameters of wheels used and the usual method of trolley pole and spring base support. This condition is practically independent of the current, and is caused by the inertia and unbalanced conditions of the wheel. Hence, it has been suggested that trolley wheels to be used for very high speeds should be of considerably larger diameter, made as light as possible, and very flexibly suspended.

The principal substitutes for the wheel trolley are the bow trolley as used extensively on the Continent of Europe, the pan scraper as used on some recent single-phase lines, and the roller trolley employed in one instance on the Pacific Slope. The European form of bow trolley with a scraping wire or semi-flat contact answers fairly well for slow-speed roads, but is expensive in maintenance and is practically inoperative at speeds much over 30 to 40 m. p. h., as the friction between scraper and wire is sufficient to saw through the contact in a very short time. The fair success of the bow trolley abroad is undoubtedly due to the low speeds at which the cars are run and to the consequent extremely light pressure used. It should be borne in mind, however, that great difficulty exists in maintaining contact between scraper and trolley wire at very high speeds unless considerable tension is placed on the trolley pole.

As a modification of the bow trolley a pan scraper is being used with some success in this country for speeds of about 50 m. p. h. One great advantage of the pan scraper is that it can be raised and lowered pneumatically. This is especially desirable on high-voltage lines, as it is difficult to insulate a trolley rope in wet weather so that it would be invariably safe with high voltage when used by the men ordinarily employed as conductors and motormen. Experiments with pans of aluminum alloy and also with pans made up of alternate sheets of copper and aluminum have been tried, and seem to indicate they can be used without excessive wear up to 50 or 60 m. p. h. where the current is not very large, as in a. c. operation. All things considered, the pan is perhaps the best all-around contact device for a. c. cars. Roller trolleys will carry an enormous current at low speeds, but are very susceptible to inertia at high speeds, owing to their great mass. There is but one road operating with roller trolleys

in this country, and here they are considered satisfactory. The speeds, however, are moderate, 35 m. p. h.; the current does not average at starting over 600 amps. and in running over 200 amps. per roller.

From this it will be seen that the subject of current collection is still unstandardized, with the trolley wheel best suited for city and light interurban service, the third-rail shoe satisfactory where the third rail is admissible, and the pan trolley the present favorite for high-speed a. c. cars. It is safe to say, however, that with the attention which is being given to this subject there are apt to be improvements, which may materially change the situation before long.

The Effect of the Rate Bill on Street Railway Accounting

An interesting question has arisen as to the effect which the passage of the Hepburn Rate Bill and its signature by the President the latter part of June will have upon the standard form of accounting for street railways. At first thought the two seem to have no connection with each other, because very few electric railway companies do an interstate business, and consequently the Hepburn Bill affects the electric railway industry directly in only the slightest way. Nevertheless, a further examination will show that the passage of the act may, and probably will, have an important influence on the form of accounting used by street railway companies.

It has long been known that the National Association of Railroad Commissioners, which represents the boards of the different States, is anxious to establish a more uniform system of accounting between the steam and the street railways in order that the main divisions at least should be the same and so that like items could be compared because so many steam lines are now electrifying parts of their systems. This subject has been discussed at a number of the meetings of the National Association of Railroad Commissioners, at which representatives of the Interstate Commerce Commission, Association of American Railway Accounting Officers, and American Street and Interurban Railway Accountants' Association have been present. The latter have manifested a willingness to take the matters in which the steam and street railway methods of accounting differ before their association and endeavor to secure such modifications as might be required to secure the uniformity sought. It is not disclosing a secret, however, to state that the representatives of the steam railroads have shown a marked indisposition to unite upon a program of this kind. All of the steam lines doing an interstate business have been up to this time to some extent, of course, under the control of the Interstate Commerce Commission, and while the reports required by that commission have been very elaborate they have not required, nor has the Interstate Commission had the authority to compel, the railroad companies to modify materially their existing systems of accounting, providing the reports were submitted in the form desired.

The Hepburn Act, however, which is far reaching in its character, is particularly stringent in regard to accounting. Section 20, which places the authority for supervising the accounts and formulating the classification of accounts of the steam railroads with the Interstate Commerce Commission, reads in part as follows:

The Commission may, in its discretion, prescribe the forms of any and all accounts, records, and memoranda to be kept by carriers subject to the provisions of this Act, including the accounts, records, and memoranda of the movement of traffic as well as the receipts and expenditures of moneys. The Commission shall at all times have access to all accounts, records, and memoranda kept by the carriers subject to this Act, and it shall be unlawful for such carriers to keep any other accounts, records, or memoranda than those prescribed or approved by the Commission, and it may employ special agents or examiners, who shall have authority under the order of the Commission to inspect and examine any and all accounts, records, and memoranda kept by such carriers. This provision shall apply to receivers of carriers and operating trustees.

Under this section it has been claimed that the steam railroad companies cannot even keep a memorandum book of their accounts, if a part of the records of the company, unless the form has first been submitted and approved by the Interstate Commerce Commission, and so delegates to that body the complete control over the steam railroad classification. Under these conditions it will not be surprising if the proposition so long dormant to adopt a uniform classification applicable to both steam and electric roads should be consummated, especially as it has been favorably considered by the government authorities and the National Association of Railroad Commissioners and has not been opposed by the Electric Railway Accountants.

A comparison of the classification adopted by the electric railway accountants and that of the Interstate Commerce Commission quickly discloses several differences which look radical, but a closer study seems to make them more differences of treatment than of principle. The steam railroad schedule has fifty-three accounts, the electric thirty-nine, but most of the additional accounts are subdivisions of accounts, which in electric operations may be combined.

There are, however, other large differences—such, for instance, as stationery and printing—which the electric includes in one account under general expenses. The steam classification provides four, one each for maintenance of way, maintenance of equipment, transportation, and general.

The question of damages is handled by the steam classification as a transportation charge, but the electric treats it as a general expense. The steam classification has loaded the cost of conducting transportation in an endeavor to reduce the size of general expenses, while the electric classification has been based on the plan of including in general expense those items which are for the benefit of the whole property or else cannot easily be divided between the three great divisions of account without estimations. The construction and equipment accounts also show differences, but as in the operating expenses they are mostly in sub-divisions of like accounts.

It should not be understood from this that at present all steam roads use the same classification. The Pennsylvania Railroad, for instance, has a classification of ninety-three accounts, and the New York Central & Hudson River Railroad has 235, but in each case the accounts are so arranged that they may be combined to fit the fifty-three accounts called for by the Interstate Commerce Commission. The same condition exists among the electric railways.

Just how these differences can be adjusted and a classification which will be equally convenient to the steam and street railway companies of the country can be secured remains to be determined. But it will not be surprising if some progress is made in this direction during the next few months and possibly in time so that some definite action can be taken on the subject by the Electric Railway Accountants at their annual meeting in Columbus next October.

THE ELECTRIC CAR EQUIPMENT OF THE LONG ISLAND RAILROAD —I*

BY W. N. SMITH

The tendency of a change from steam to electric motive power on suburban lines such as those of the Long Island Railroad is to convert them into a rapid transit system of the same general type as the subway and elevated systems now operating in the largest cities. The building up of any suburban territory is dependent upon the transportation facilities provided for it, and the inevitable result of improvement in transportation is to increase the traffic to a degree gradually approaching the density prevailing on metropolitan rapid transit lines. It was with these ideas in mind that the management of the Long Island Railroad decided to adopt the multiple unit system on its electrified sections.

The design of the car equipment of the Long Island Railroad was based upon a careful study of the traffic conditions as they were outlined by the railroad officials at the commencement of the undertaking, and called for trains with the number of cars varying from two to six per train at different hours of the day, in regular operation, while heavy excursion travel to the beaches and race tracks would occasionally require trains of ten or twelve cars. Some of the service is express and some local. It was deemed of the greatest importance to provide a single type of equipment that should be uniformly available for all the varying conditions of train service.

The proposed local service on the Atlantic Division involved making stops at an average of about 1.6 miles apart. The express service originally contemplated between Flatbush Avenue Station and Jamaica provided for only one intermediate stop in the 9.63 miles between them. On the Rockaway Beach Division, a local train making all stops between Flatbush Avenue and Rockaway Park would average one stop every .99 mile, while an express run to Rockaway Park involved a run of 7 miles in length at the highest practicable speed.

These runs called for a schedule speed including stops of about 25 m. p. h. for local trains on the Atlantic Division, and about 30½ m. p. h. for the express trains. Upon the Rockaway Beach Division, with relatively more frequent stops, the local run called for a schedule speed of about 20 m. p. h., while the express run with seven stops in the 15.88 miles called for about 25 m. p. h. The average length of stop was usually assumed at 30 seconds.

The headway of trains on the proposed schedule was, between Flatbush Avenue and Jamaica, about twenty minutes during the greater part of the day, with ten minutes during the morning and evening rush hours, and thirty to sixty minutes during the early morning hours. During the rush hours express trains were also to be interspersed with locals. Between Flatbush Avenue and Rockaway Park the local trains were to run on about half-hourly headway during the most of the day, this being decreased to twenty minutes during the rush hours, and sixty minutes during early morning hours. Express trains were also to be interspersed between locals during the rush hours. The Brooklyn Rapid Transit trains operating over parts of the Long Island lines were to be mostly express, running on about half-hourly intervals during the early part of the day, but from noon until late at night on fifteen-minute headway. Upon days when there would be both a race-track movement on the Atlantic Division and heavy travel to the beaches, the headway of the combined traffic on Atlantic Avenue was to be reduced to about 3 1-3 minutes.

The Long Island Railroad local trains as originally proposed were to consist of two and three cars, except during the rush hours, when they were to be of six cars. The express trains were to consist of three cars each. The Brooklyn Rapid Transit trains on ordinary days were to be of four cars each, increased to six on holidays.

The maximum possible speed for express runs can be made when all the cars of a multiple-unit train are motor cars. Ordinary schedule conditions, however, usually permit a portion of each train to consist of trailers, and the most severe condition of frequent stops can be met if the proportion of trailers is not more than one trailer to two motor cars. A considerable saving in the weight of the entire train is thus possible without exceeding either the tractive power of the motors or their ability to radiate the heat developed by the frequent accelerations which are the severest tax upon their capacity. In fact, the proportion of motor cars to trailers is based upon the speed and time characteristics of the schedule and the frequency of stops.

The fact that the Atlantic Division is partly in a subway, and the need of interchangeability with the rolling stock of the Interborough Rapid Transit Subway, had much to do with the design of the cars. The complete success of the first all-steel passenger cars ever built, and which were designed by George Gibbs for the New York Subway, led him, in his capacity as chief engineer of the Long Island Railroad electric conversion, to advocate their use on this road as well. To the Interborough Rapid Transit Company and the Long Island Railroad Company belong, therefore, the distinction of being the first railroads in the world to adopt this radical departure in car construction, thus insuring to the public complete immunity from the danger of fire in cars equipped with apparatus carrying powerful electric currents. The incidental advantages of these steel over wooden cars in superior strength and durability are, of course, likewise of importance in insuring their adoption. As the Long Island Railroad cars were obliged to meet very similar conditions, both as to the physical nature of the route to be traversed and the class of travel to be handled, they were built along practically the same lines as the above mentioned steel cars for the New York Subway. In fact, except for the steps, which are made necessary by the low platforms at stations in the suburban districts, the steel car bodies are practically identical with those designed for the New York Subway.

It has been common practice in the past to build passenger coaches for rapid transit service of rather lighter construction than the standard steam railway coaches, chiefly because the steam locomotive was universally used and it was desired to keep down to a minimum the weight behind the locomotive. The multiple-unit system of control, however, which allows the distribution of the motive power under all the cars, removes this restriction upon the weight and makes it possible to construct the parts of a suburban passenger car with more regard for rigidity, and greater ability to resist shocks. Multiple-unit cars for this kind of service can therefore be made as substantial as the requirements of safety and durability demand, but it should also be noted that the steel construction adopted does not materially increase the weight over what would be called durable construction in a wooden car, the increased strength and durability being secured without sacrificing operating economy.

CAR BODIES

The principal dimensions of the steel car bodies are as follows:

* For previous articles on the Long Island Railroad electrification, see STREET RAILWAY JOURNAL for Nov. 4, 1905; April 7; June 9, 16 and 23, 1906.

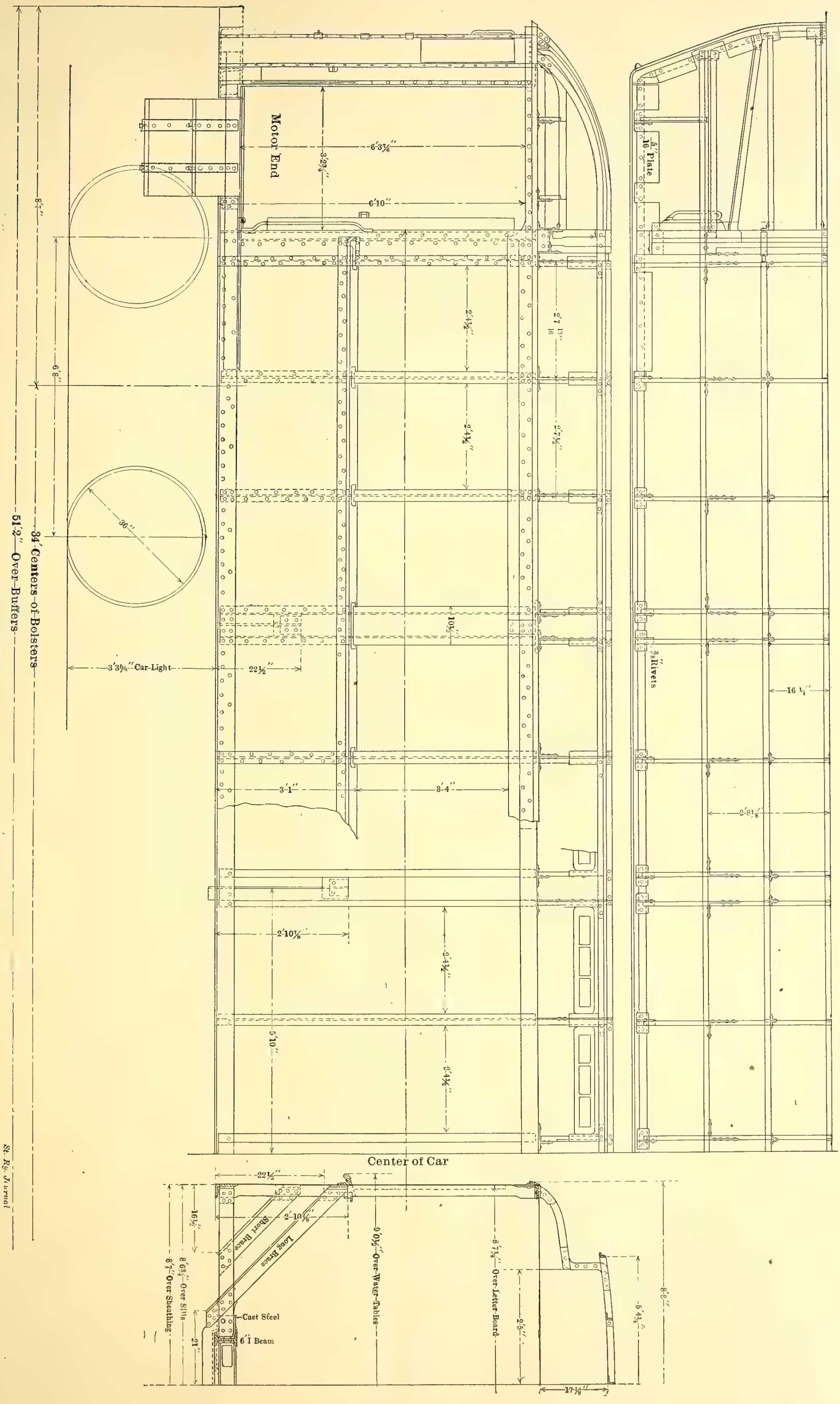


FIG. 1.—GENERAL FRAMING PLAN

	Ft.	Ins.
Length over body corner posts	41	½
Length over buffers	51	2
Length over draw-bars	51	4
Width over side sills	8	6¾
Width over sheathing	8	7
Width over eaves	8	8

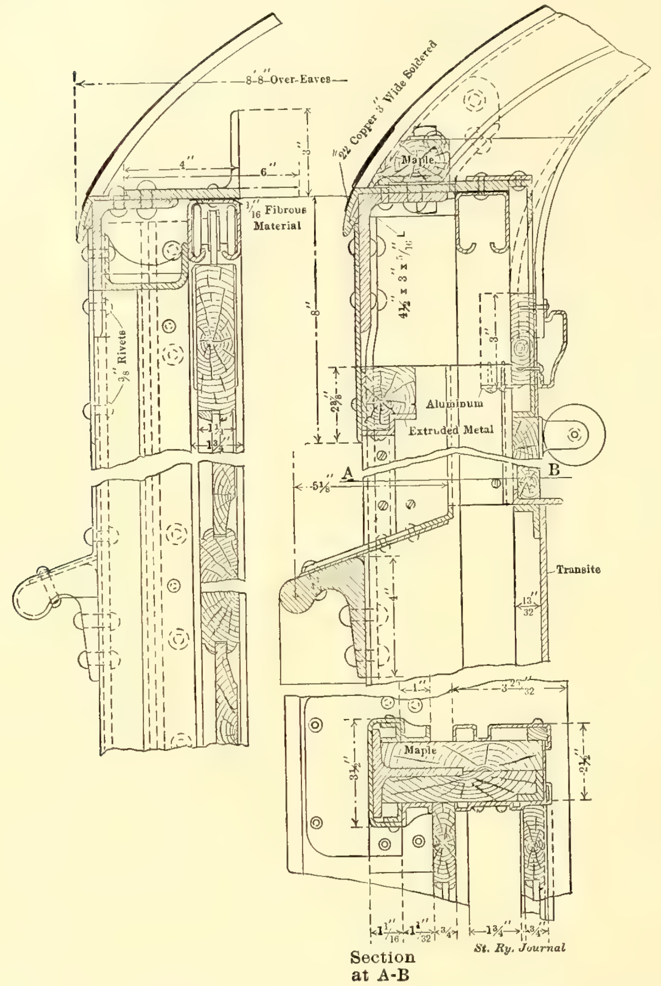


FIG. 3.—DETAILS OF BODY CORNER POSTS AND DOOR POCKET

	Ft.	Ins.
Width over window sills	9	½
Width over platform floor	8	10
Height from under side of sill to top of plate	7	1
Height from underside of center sill to top of roof	8	9¼
Height from top of rail to under side of sill at truck center (car light)	3	3⅝
Height from top of rail to top of roof with car light	12	¾

The principal dimensions of the steel trailer cars are the same as those for motor cars, and they may, if desired, be readily converted into motor cars.

CAR-BODY FRAMING

While the formation of the car body is practically identical with the conventional type of steam railroad coach, the adoption of steel as the constructive material is responsible for some differences in the general designs of car framing that have been hitherto followed in wooden car construction. These differences will appear in the course of this description, and are illustrated in the accompanying drawings. Most of the standard parts in the framing of the wooden cars have their counterparts in the framing of the steel car.

The principal members of the car framing are of the following rolled steel shapes:

Side sills, 5 x 3 x ½ in. angles.
Center sills, 6-in. I-beams, 17.25 lbs. per ft.
Body end sills, 3 x 2 and 4 x 2 angles.
Body end posts, 2½ x 2 x ¼, and 2 x 1⅜ x ¼ angles.
Compound side posts, 3 x 2 x ¼ Ts.
Single side posts, 3 x 3 x ¼ Ts.
Side plates, 4½ x 3 x 5-16 angles.
Body end plates, 3 x 2 x ¼ and 3 x 3 x ¼ angles.
Platform sills, 4 x 3 x ⅝ angles.
Platform end sills, 6 x 3½ x ½ angles.
Belt rail, 4½ x 2¾ bulb angles.
Carlines, 1¾ x 1¼ x 3-16 angles.
Purlines, 1½ x 1½ x ⅛ angles.
Hood curve angles, 1¾ x 1¼ angles on top, and 3 x 2 and 2 x 2 angles on end.
Vestibule end bow, 3 x 3 x 5-16 angle.
Cross truss, horizontal ties, 4 x 3 x ⅜ angles.
Cross truss, diagonal brace, 4½ x 3 x 5-16 angle.
Bridging, ⅜ x 4½ plates.

Reference to the accompanying drawings and photographs will indicate the general manner in which the framing is put together. The center sills consist of two heavy I-beams

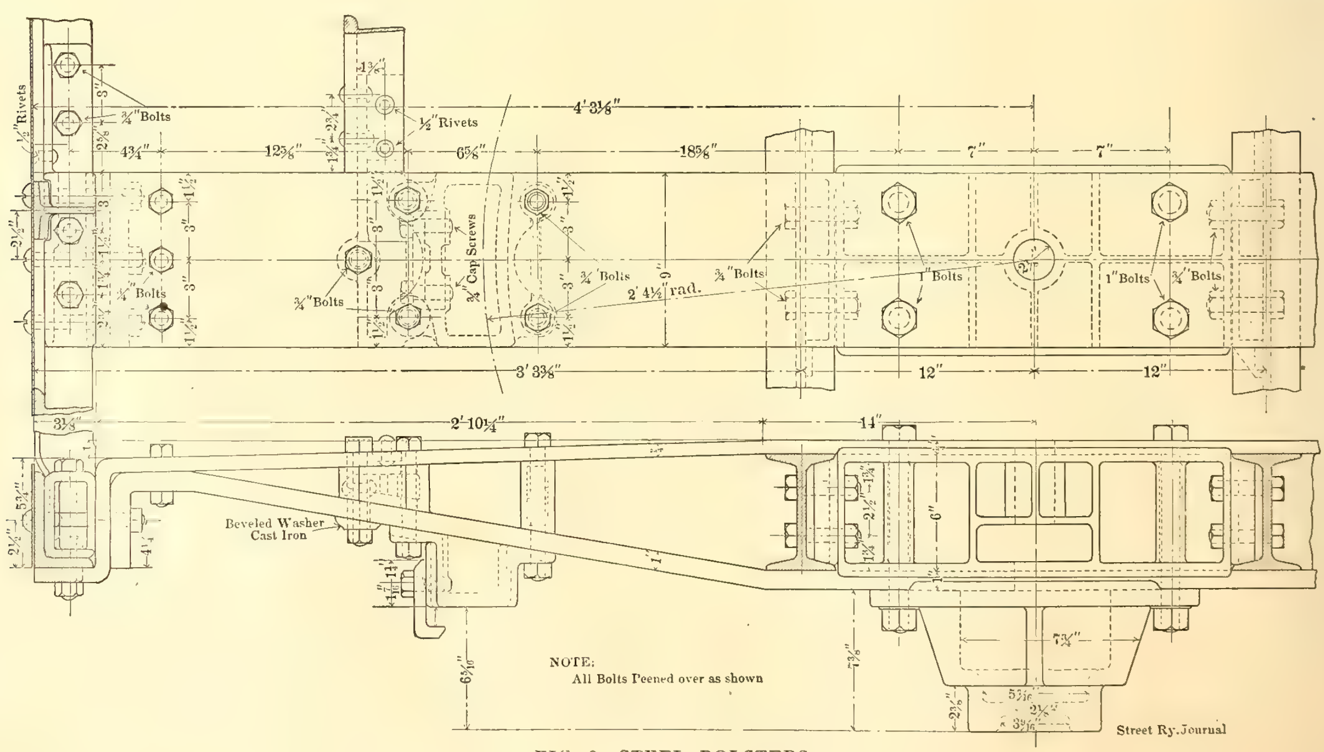
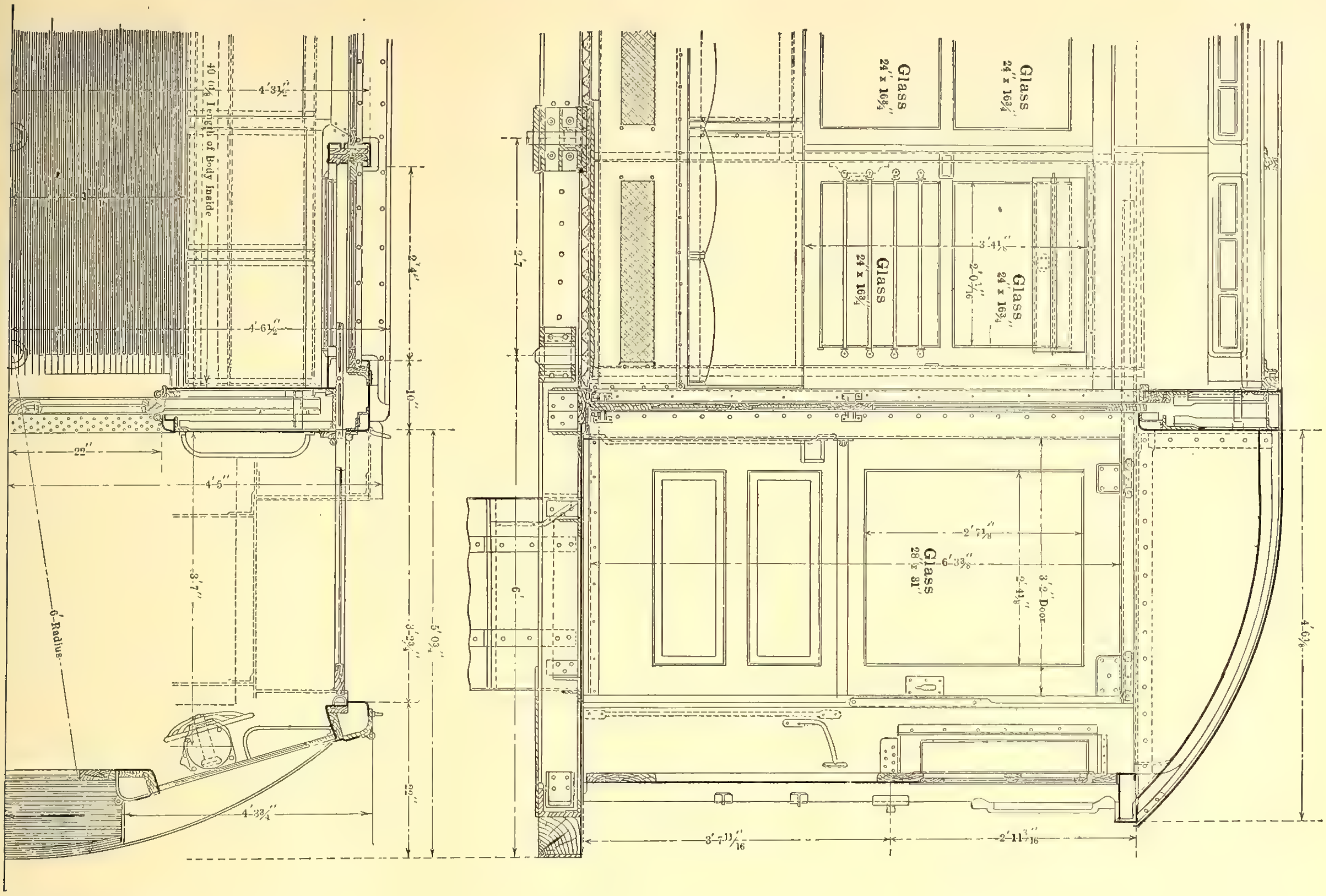


FIG. 2.—STEEL BOLSTERS

which are continuous between the platform end sills. The side sills are of heavy angles. Two extra sills, extending back to the body bolster, and composed of 4-in. x 3-in. angles, support the vestibule platforms. Fig. 1 is a general plan of the car framing.

The bolsters are of the built-up type, the top and bottom members being made of two rolled-steel plates, as shown in Fig. 2. They are machined on their outer ends to fit together perfectly, the top member being bent down over the bottom member and securely bolted to it. In the space between the top and bottom members and between the center sills is placed a malleable-iron draw casting, machined so as to be a perfect fit between the bolster plates and the longitudinal sills to which it is bolted. Between the center and the side sills malleable-iron struts are inserted. The top member of the body is ¾-in. x 10-in. steel plate, and the bottom member of 1-in. x 10-in. The body center plates are of cast steel, machined to fit the truck center plates and the bottom member of the body bolster, and have their edges lipped over the bolster, to which they are secured by heavy turned bolts in reamed holes.



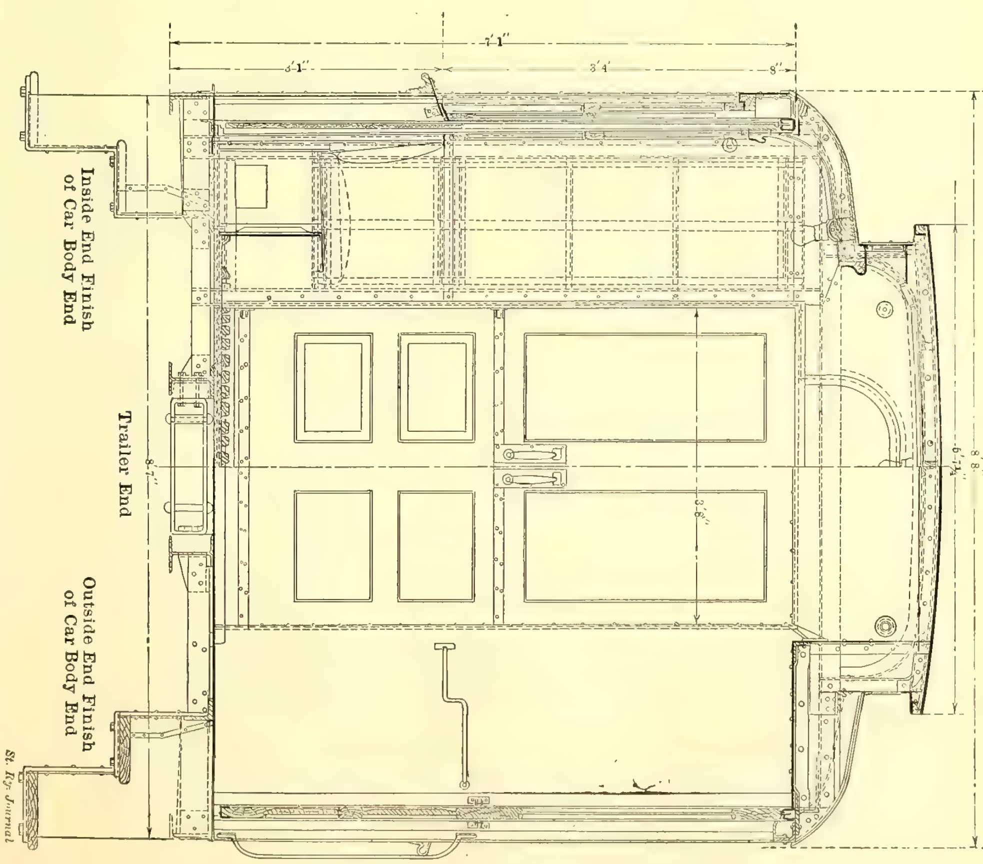


FIG. 4.—SECTIONS THROUGH END OF CAR, SHOWING SLIDING DOOR

The floor framing and transference of the floor load to the side trusses of the car are different from the construction hitherto followed in wooden coaches. Needle beams

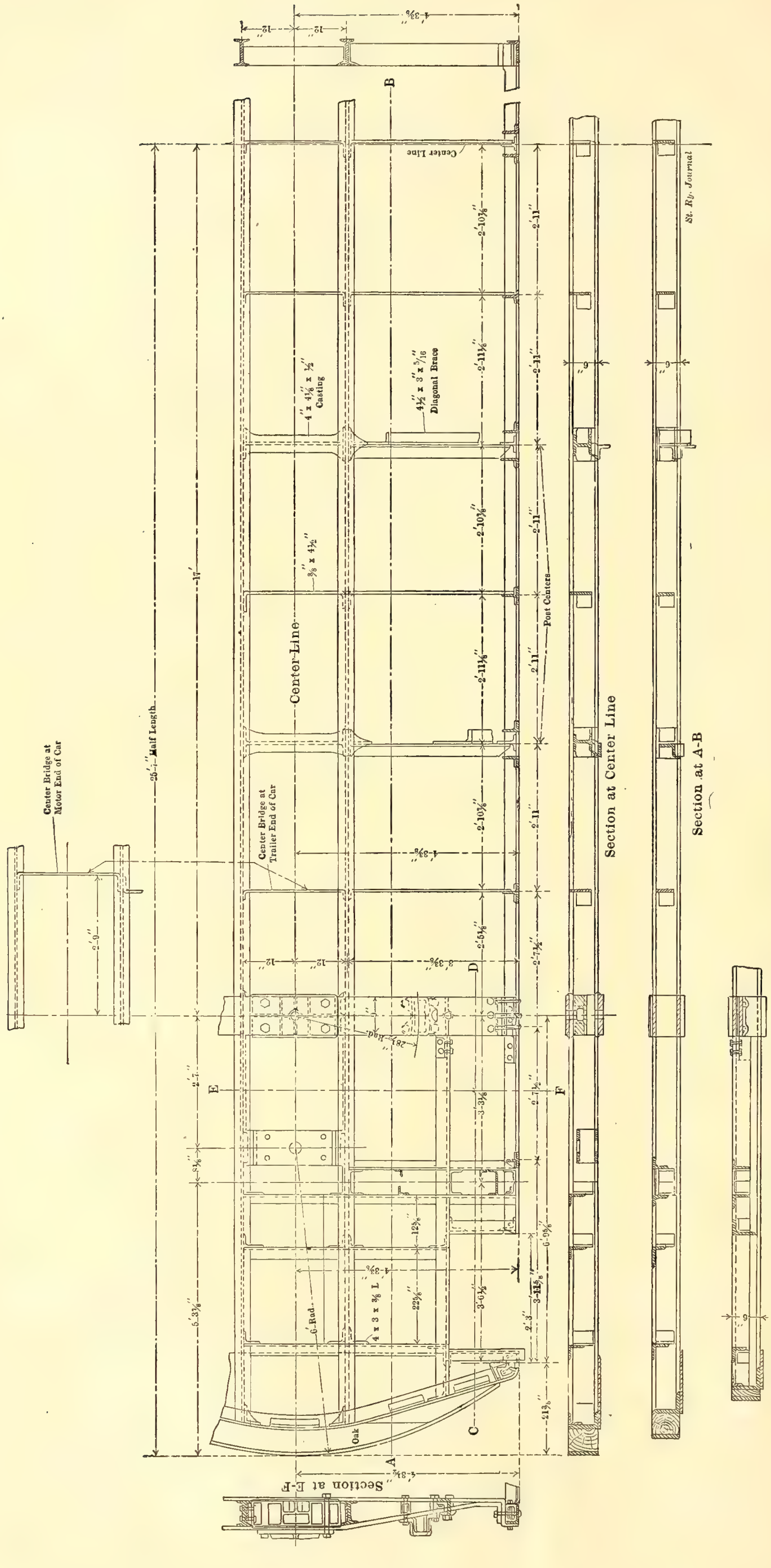


FIG. 5.—FLOOR FRAMING OF STEEL MOTOR CAR

and longitudinal underneath trussing are dispensed with, the construction being as follows:

The belt rail, side sills, and side posts are riveted together at their intersections, making a truss of square panels so reinforced by the ⅛-in. steel plate side sheathing of the car that they constitute a stiff truss without the necessity of diagonal bracing. Instead of needle beams and longitudinal truss rods, four sets of diagonal braces reach down from the side posts of the car below the belt rail, and are fastened to the bottom framing as shown in the sectional elevation in Fig. 1. These braces are concealed in the backs of the stationary cross seats, so that their presence in the car is not evident after the seats are installed. The bottom chords of the four cross trusses have riveted to them heavy steel casings which form struts between the two center sills, thus considerably increasing the stiffness of the bottom framing. The center sills are further stiffened by the introduction of the draw-castings for the attachment of the draft gear, and by the body end sill and platform end sill construction, also by numerous cross bridges. The platform end sills are of heavy angles, bent to give the proper shape, and are continuous from side to side. The vestibule end posts are fastened to them with heavy steel castings.

The end sills of the car body are not made as continuous pieces extending completely across the ends, but are in the form of a double set of short pieces of angle-bar fastened between the side and center sills by angle-iron braces, making a stiff construction for holding the side and center sills rigidly in line. They constitute a set of box-framed struts, or filling-in pieces, between the sills, at the ends of the car.

The body corner posts are built up in a special form of construction. The corner

post proper consists of an angle-bar fastened to the end sill and the end plate, which is reinforced by a Z-bar, and also by the first side post of the car, which is only about 10 ins. back from the end and is riveted to the side sill and the side plate. The first post and the end post are practically made into one member by the ⅛-in. side sheathing, which is rounded into the form commonly used in the outside shape of the corner post of the car. This side sheathing is securely riveted by round-head rivets pockets is shown in Fig. 4. There are sixteen posts along each side of the car, of which six are compound, being made of two 3-in. x 2-in. x ¼-in. angles, spaced 6 ins. apart. The remaining side posts are single 3-in. x 3-in. x ¼-in. Details of both types of side post are shown in Fig. 6.

To the top of the side posts are secured side plates of 4½-in. x 3-in. angles, which are not broken at the vestibule side doors, but are continued in one piece from end to end of the car vestibule hoods, where they are fastened to the end bows,

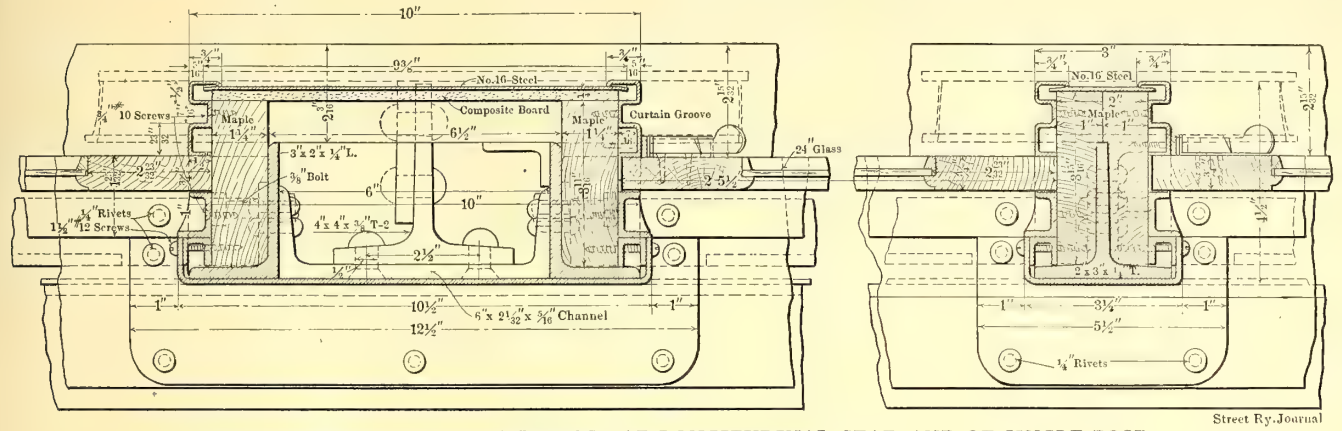


FIG. 6.—SECTIONS OF DOUBLE POST AT LONGITUDINAL SEAT, AND OF SINGLE POST

which are of heavy angle bent into the proper shape to form the convex ends of the car vestibules.

The end plates of the car body framing are of heavy angles. They are in duplicate on account of the door pocket construction, and are framed directly across at about 4 ins. above the level of the side plates, being connected to the latter by a pair of braces of heavy angles forming a sort of "Z" connection. This enables the end plates to be raised high enough to admit of the insertion of the steel door rails at the proper height for carrying the sliding doors in the ends of the car body, and also facilitates the curving of the roof, which is somewhat lower than is usual in steam railroad practice on account of the clearances made necessary by the tunnel sections of the railroad. Their position is shown in Fig. 4.

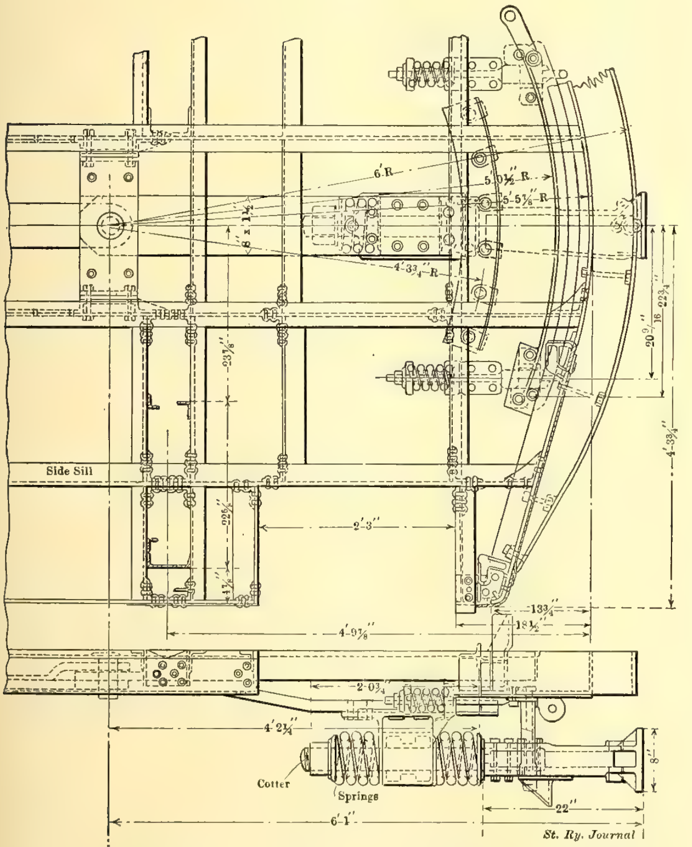


FIG. 7.—PLAN AND LONGITUDINAL SECTION OF DRAFT RIGGING

to the angles and Ts constituting the post, making an end-post construction that is practically 3 ins. thick and 10 ins. long. (See Fig. 3 for details of this construction.) Immediately toward the center of the car from this end post is the pocket for the sliding doors of the vestibules, and toward the center of the car from this pocket, and at right angles to it, is the pocket for sliding end doors of the car body. The back end of this pocket is formed by a 6-inch steel channel with flanges pointing inward and running up from the end sills to the angle braces that connect the side plates to the end plates of the car. The general arrangement of the door

DRAFT GEAR

The draft gear comprises a spring draw-bar of the Van Dorn automatic type, supported on a sector bar under the car platform, the radius bar being centered upon a pin set in a cast steel auxiliary bolster bolted to the center sills about 2 ft. 7 in. in advance of the body bolster. Reaching back from this pin to the body bolster, where it is fastened in a similar way, is a continuation of the radius bar, the above mentioned pin construction being designed to form a sort of knuckle in the radius bar, which cannot be made long enough to reach all the way back to the body bolster because of the 90-ft. radius curve around which the cars are designed to run. At either side of the draw-bar, safety coupling chains have been provided, fitted with springs and anchor forgings fastened to the anti-telescoping plate under the platform end sill. To carry the weight of the radius bar, its outer end is carried in a sector guide directly over the draw-bar proper, just back of the draw-head. The buffer beams are of oak, faced with ½-in. x 6-in. steel plates. Details of the draft gear are given in Fig. 7.

ROOF

The roof framing of the car consists essentially of the carlines, arching across the side plates. They are made in a single piece of bent steel angle, reinforced by additional short pieces of angles at the bends which constitute the deck posts. These small angle reinforcing pieces are for the purpose of supporting the deck sills and furring strips to which

the headlinings and roofing are fastened. Fig. 1 shows how the roof connections are made.

The roof of the vestibule is supported on arched angle-bows which are riveted to the end bows and to the end car-lines, which are of a little heavier angle than the other car-lines, and are in duplicate on account of the peculiar construction of the body end post previously described.

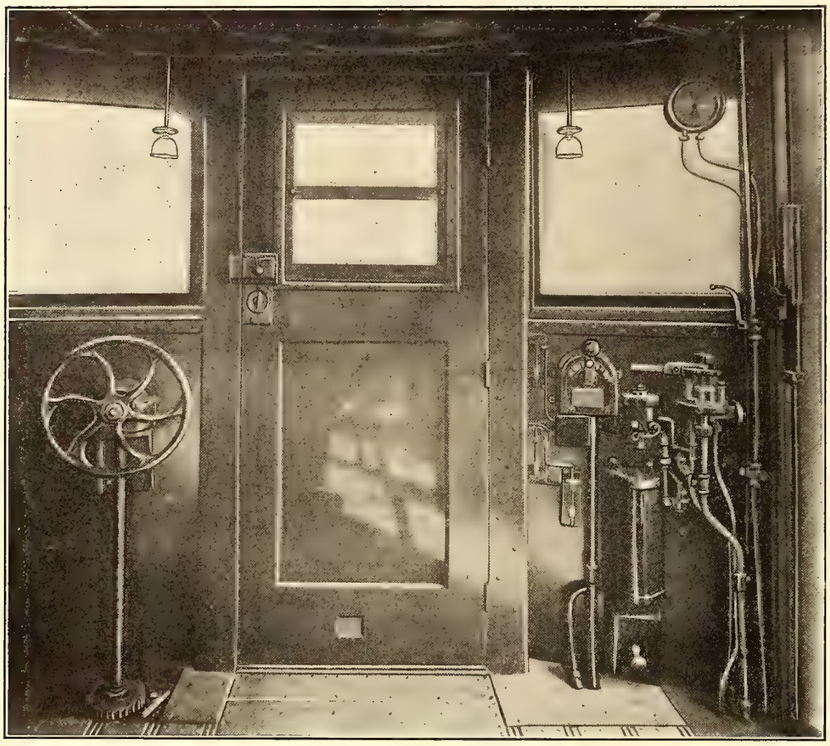


FIG. 8.—VESTIBULE OF STEEL MOTOR CAR

The roof carlines are connected by purlines of light steel angles. The carlines are secured to malleable iron castings which are riveted to the side plates, and the purlines, which are of about the same weight angle as the carlines, are riveted to the former with small angle braces. The carlines and purlines are faced with a furring of maple, secured by bolts, to which the roofing and headlining are fastened by wood screws. Maple blocks are also secured to the side plates, and hood bows, for the support of the roof covering and the headlinings. The deck sills and deck plates are of maple, so that the roof and its lining can be readily put up with wood screws.

FIG. 9.—STEEL MOTOR CAR

A very light roof covering is used, consisting of composite board 3/8-in. thick, except over the vestibule, where it is of No. 16 gage sheet steel, the whole being covered with heavy canvas laid on with white lead.

The eaves of the car are made waterproof by running the canvas cover down over a strip of No. 22 sheet copper 3 ins. wide. This laps over and is soldered to the eaves molding, which is composed of extruded metal riveted over the side plate and end bows, and joined together at the corners of the car by special castings. The eaves molding, in turn, extends down over the letterboard.

VESTIBULES

The vestibules are of the Gibbs patent type with floors of steel plates. The vestibule side doors are arranged to slide in pockets in the sides of the car, leaving the entire platform to the passengers. These doors close against pneumatic cushions so as readily to release the clothing of passengers if caught by the closing of the door. The device for operating the side doors consists of a series of bell cranks and levers so arranged that the movable parts are either overhead in the vestibule or entirely outside of it, leaving the entire interior of the vestibule clear. The side doors are operated by brakemen standing outside of the doors at the extreme end of the vestibule. Side steps are provided, with plain wooden treads, the gangway being fitted with trap doors of 3-16-in. sheet steel, to enable the use of the entire width of the vestibule when the side doors are closed. The vestibule floor and drop doors are covered with the Mason patent floor covering. The vestibule end door, when in the extreme open position, is folded over the master controller, the brake valve and all other apparatus in the motorman's compartment. The upper half of this door is glazed, like the others. When this door is shut, and the side doors closed, the entire vestibule is available as a motorman's compartment, and the above mentioned control apparatus is then entirely exposed. A view of the vestibule under these conditions is shown in Fig. 8.

The body end doors are of the double sliding type and are fitted with a door coupling device that will hold them in any desired position to prevent them from closing when trains are rounding curves. The marker lamps which are mounted on the hood over the vestibule platforms are operated from

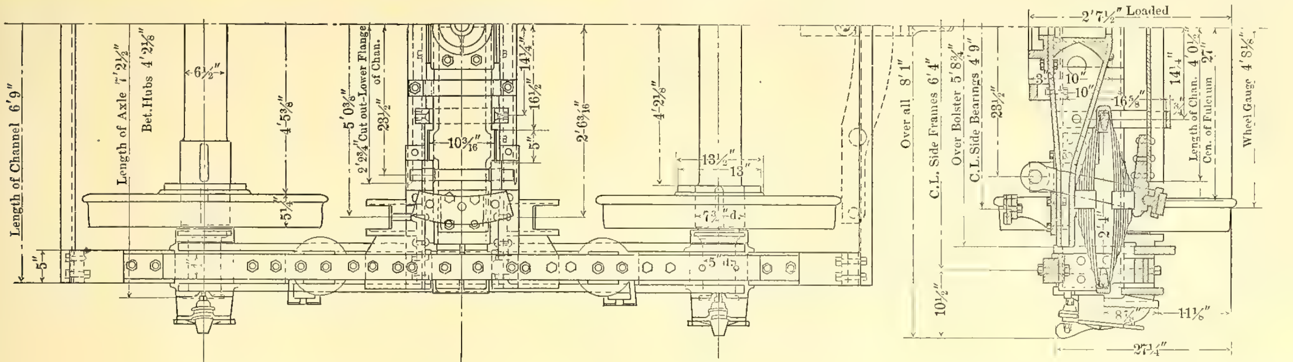
inside of the vestibule by handles extending through the canopy sheathing. The handles are fitted at the lower end with discs carrying colored crystals that correspond to the color of the lenses on the four sides of the marker lamps.

In the vestibule at the motor end of the car, just forward of the end door pocket on the left-hand side facing forward, is placed a swinging door, made convex, of pressed steel so as to form a pocket to contain the auxiliary control switchboard panel, which will be described next week.

All motor cars are equipped with pilots suspended from the platform buffers, and the vestibules are fitted with pantagraph safety gates and guard chains to prevent trainmen and passengers from falling between the cars. The usual grab handles are also fitted to the sides and ends of the vestibules. An air whistle is also provided over each vestibule, with its operating valve situated conveniently to the control apparatus. Wooden paddles are carried in the vestibules of all cars, which are used to raise the contact shoes from the conductor rail when necessary.

SHEATHING

The side sheathing of the car consists of steel plates 1/8 in. thick, their lower edges being flush with the bottom of the sill. The bulb angles which form the belt rail and the window sills overlap this sheathing. The post covers between the windows are of special pressed steel, flanged out at their lower ends to fit over the belt rail which runs along the entire length of the car body outside of the posts (see Fig. 6). The top ends of the post covers extend under the letterboard, which is a steel plate 7 1-16 ins. wide, running the entire length of the car, riveted to the side plates. The letterboard in turn is overlapped by the eaves molding as described above. In this manner the entire outside covering of the car is waterproofed by simply overlapping its component parts, avoiding all cracks into which the water can run by gravity. All joints between the side sheathing plates are covered with sheet-metal battens, laid on with thick red lead and secured by rivets.



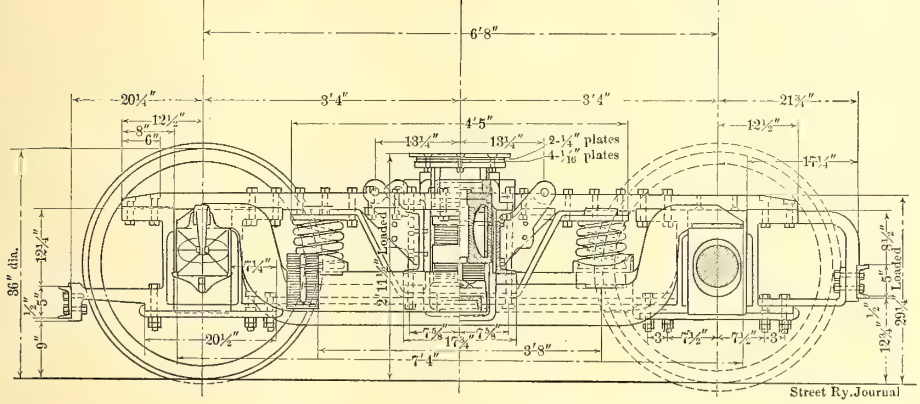


FIG. 10.—DETAILS OF MOTOR TRUCK

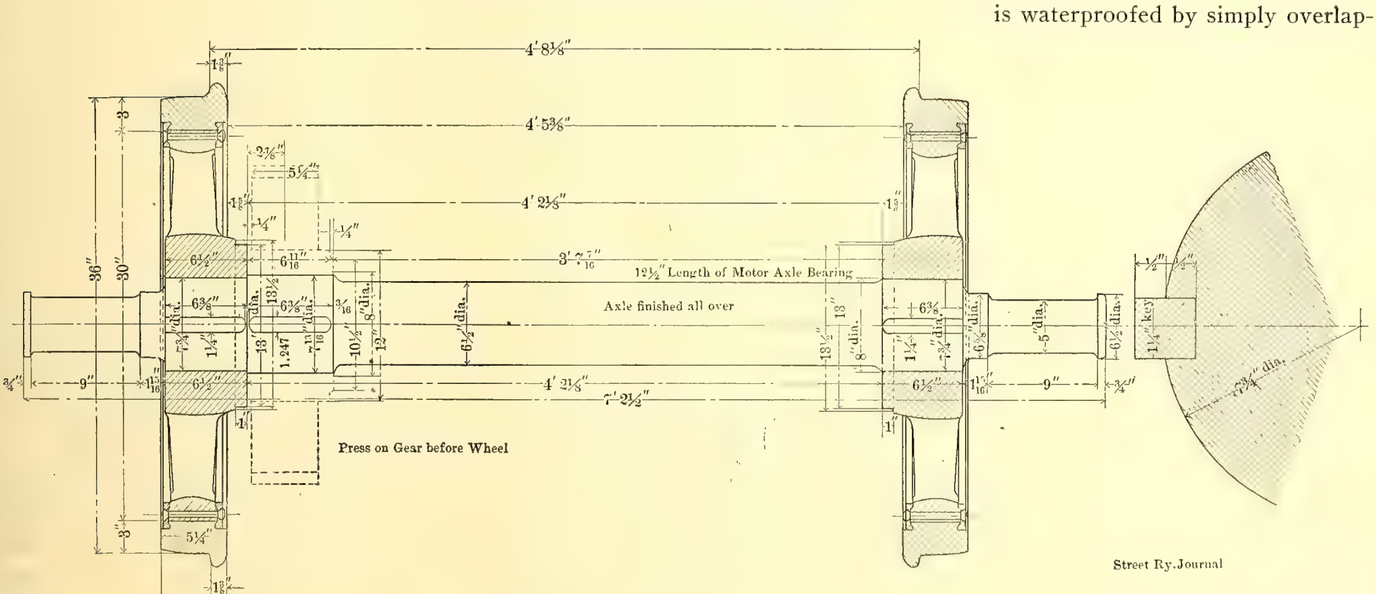


FIG. 11.—SECTION OF WHEELS AND AXLE ON MOTOR TRUCK

FINISH

The flooring of the car body is of corrugated sheet iron, and is supported by the longitudinal sills and the steel-plate bridging that is riveted across the space between the sills. The corrugated sheets are provided with metal clips which

are riveted to the sheets at about 10-in. centers, to secure the "Monolith" plastic floor upon which, after being finished, the maple floor strips are laid with brass screws. This monolithic floor is absolutely fireproof and is laid on in the form of a cement, which, when set, has a smooth, hard finish. The construction is shown in Fig. 4.

The interior of the car is finished as follows: The window panels, end panels and mouldings inside of the car are of sheet steel painted a dark green color and relieved by gold stripes. The headlinings are composite board, painted light green, decorated in gold. The hardware fittings are of lacquered bronze. The arrangement of the seats is similar to that used in subway and elevated railway cars generally. The seat frames are of steel construction carried upon brackets riveted to the side posts. The cushion and seat backs are of rattan. The seating capacity of each car is 52 persons. Strap rails of polished mahogany are also provided running along each side of the car in the clere story, supported in bronze brackets.

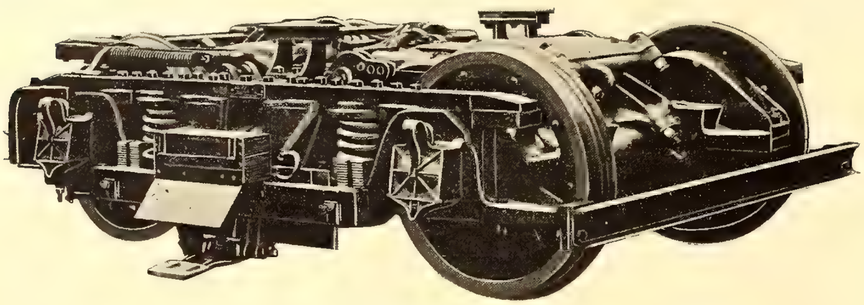


FIG. 12.—MOTOR TRUCK

The wainscoting is of steel, backed by asbestos "Ceilinite," so as to make it conduct heat less readily.

The side windows are arranged to raise from the bottom, and glass in all doors and windows is polished plate. The deck sash are arranged to secure ample ventilation without drafts, all being operated simultaneously by operating levers at both ends of the car. They are fitted with double-thick, chipped sheet glass.

The side windows and the body end doors are provided with Pantasote curtains. The window sash are fitted with counterbalancing steel springs, and sash locks and lifts of an improved type. All window cappings and other moldings inside of the car are of aluminum shapes, secured by nickel-plated brass screws. The front windows of the vestibules are stationary. Ventilation in the vestibules is secured through the movable sash in swinging doors, or through side vestibule doors which are equipped with combination doorholder and motorman's arm rest.

All the metal work used in the body framing is given one coat of protective paint before assembling and two coats after assembling. After completion, the outside of the car was cleaned perfectly smooth by the sand-blast process, painted with two priming coats, two surfacing coats and with two coats of Indian red, the Railway Company's standard form of lettering and striping in gold leaf, and finally varnished three coats.

The surfaces of the sash, doors and moldings are painted and given three coats of the best wearing body varnish. The floors were all given two coats of paint. The headlinings were given three coats of inside rubbing varnish and rubbed to a dull finish. The roof was given one heavy coat of white lead paint before applying the canvas, another coat along the flashing after fastening it down, and two coats of metallic paint and pure linseed oil after completion.

There are 130 motor cars and four trailers, all of which were built at the Berwick, Pa., shops of the American Car & Foundry Company. They were personally designed by George Gibbs, chief engineer of electric traction of the Long Island Railroad, and a number of United States and foreign patents have been issued to him covering the various features of the construction.

Fig. 9 is a view of the completely equipped steel car, showing the vestibule end door closed, as it appears when the vestibule is being used as the motorman's compartment.

TRUCKS

The motor and trailer trucks are of the M. C. B. type, the wheel base of the motor trucks being 6 ft. 8 ins. for 36-in. wheels, the trailer trucks being 5-ft. 6-in. wheel base for 30-in. wheels. The distance between truck centers is 34 ft. A drawing of the motor truck is given in Fig. 10, and its general dimensions are as follows:

Gage of track, 4 ft. 8½ ins.
Distance between backs of wheel flanges, 4 ft. 5⅜ ins.
Height of truck center plate above rail, car body loaded with 15,000 lbs., 31½ ins.
Height of truck side bearings above rail, car body loaded with 15,000 lbs., 35½ ins.
Wheel base, 6 ft. 8 ins.
Weight of truck complete with two gears, but without motors, 12,800 lbs.
Weight on center plate with car body loaded, 30,885 lbs.
Weight of one motor on truck transom, 3500 lbs.
Torque of one motor on truck transom, 3000 lbs.

The truck bolster and track center plates are steel castings machined to the proper dimensions. The side frames are of wrought iron, machined on four sides. All bolt holes in the side frames are accurately drilled to templates. The end frames are of steel channels. The pedestals are forgings lipped over the sides of the car frames and are machined on all surfaces where they have a bearing, either on the side frames, pedestal caps, or the journal boxes. The transom consists of rolled-steel channels resting in the side frame castings, and provided with chafing plates of wrought iron. The equalizer bars are of wrought iron in one piece, without welds, machined on top edges for spring seats, and on the bearing surfaces over the journal boxes.

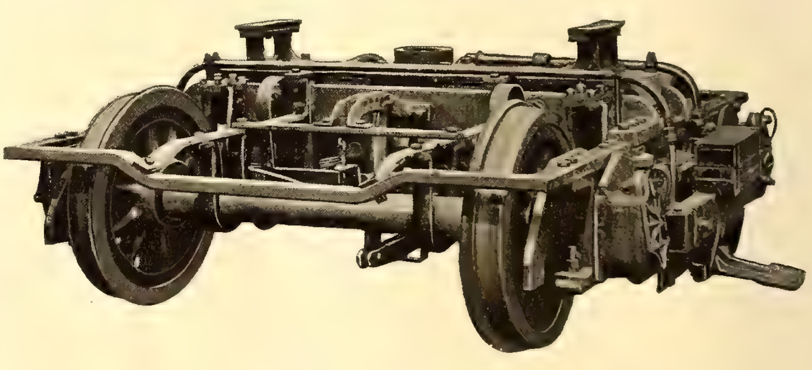


FIG. 13.—TRAILER TRUCK

The pedestal caps are of wrought iron, of the individual type, machined and carefully fitted to the pedestals, being secured with hammer-driven turned bolts in reamed holes. The transom top braces are of wrought iron secured by turned bolts in reamed holes. Safety hangers and swing hangers are of wrought iron. The spring plank is of steel channel. The brake hangers, rods, levers and equalizing beams in the brake rigging are of forged iron, and the pins

throughout the brake rigging are accurately turned to dimensions, all wearing parts being case-hardened to prevent rattle. The motor suspension consists of a steel wearing plate on the transom on which the motor nose rests with a wrought-iron strap reaching over the nose and bolted to the transom.

The wheels are steel tired, with separate cast-steel spoke centers. The dimensions are as follows:

	Ins.
Outside diameter of tire	36
Total width of tire	5¼
Width of flange	1¼
Height of flange	1⅛
Width of hub	6½
Bore of hub (finished)	7¾

The tires are of Latrobe steel with standard M. C. B. tread, 3 ins. thick, fastened by shrinkage and with double-lipped retaining rings. Tests of the tire steel showed about 125,000 lbs. tensile strength per sq. in. The axles are of open-hearth steel and conform to the test requirements of the Pennsylvania Railroad Company's standard specifications. Key seats are milled in the wheel seats and gear seats. The gears are forced on at about 50 tons pressure and the wheels at about 75 tons. Fig. 11 shows the details of the motor truck wheels and axles.

The double elliptic bolster springs are of crucible steel. The equalizer springs are of double-coil pattern of open-hearth steel. Brake release springs are of the single-coil type. The track bolster is of cast steel, with seats for the center plate, side bearings, spring cap, and the chafing surface, cast on and machined. The bolster spring seats and their bearings are also of cast steel, as are also the side bearings, which are bolted to the bolster with turned bolts. The center plate is of cast steel machined and secured to the bolster by turned bolts. Combination bracket and guide castings supporting the brake release springs are also of cast steel, securely bolted to the side frames.

The journal boxes are of the cast-steel "Symington" type, machined on the inside for the M. C. B. standard journal bearing and wedge and on the outer faces for the box cover, and are provided with "Soule" dust guards. The brake head is of standard M. C. B. pattern of cast steel. The brake shoes are of the "Diamond S" type, composed of soft grey iron with chilled inserts and provided with wrought steel backs. The finish comprises three coats of paint, the last coat being mixed with varnish. Fig. 12 shows the truck with the motors and the third-rail shoes mounted upon it.

The trailer trucks are of generally similar type, but of 5-ft. 6-in. wheel base and somewhat lighter construction. The bolsters are of white oak, in three pieces, with iron plates placed between the timbers, securely bolted together with rough machine bolts, which also carry the bolster chafing plates. The center and side bearing plates are of the same height above the rails as in the motor trucks. The bolster is gained on the top for the center plate, on the bottom for the spring seats, and on the sides for the chafing plates. The spring plank is also of white oak, in one piece. The center plate, side bearings, bolster spring caps, seats, equalizing spring caps and seats, chafing plates and journal boxes are of cast steel. The frames, pedestals, pedestal caps, tie bars, transom, equalizing bars, frame braces swing and safety hangers, spring plank axles, and brake rigging are of forged iron. The brake head and shoe are similar to those in the motor trucks. The weight of a trailer truck is 9400 lbs.

The wheels are steel-tired, with separate cast-iron spoke centers. The following are the dimensions:

	Inches.
Outside diameter of tire	30
Total width of tire	5¼
Width of flange	1¼
Height of flange	1⅛
Diameter of axle at center	4½

The tires are of the same type and are secured in the same manner as those on the motor trucks, and the wheels and axles also conform to the same specifications respectively. The journals are 4¼ ins. x 8 ins. The finished truck is illustrated in Fig. 13. Both motor and trailer trucks were manufactured by the Baldwin Locomotive Works.

THIRD-RAIL SHOES

The standard third-rail shoes on the Long Island cars are of the hinged-slipper type, supported on the usual wooden beam, which is clamped against the notched face of the equalizer spring seat castings, providing means for vertical adjustment. Upon the center of the beam is placed a 600-amp enclosed-type fuse in a wooden box, with a hinged cover and lined with asbestos. The arrangement is shown in detail in Fig. 14.

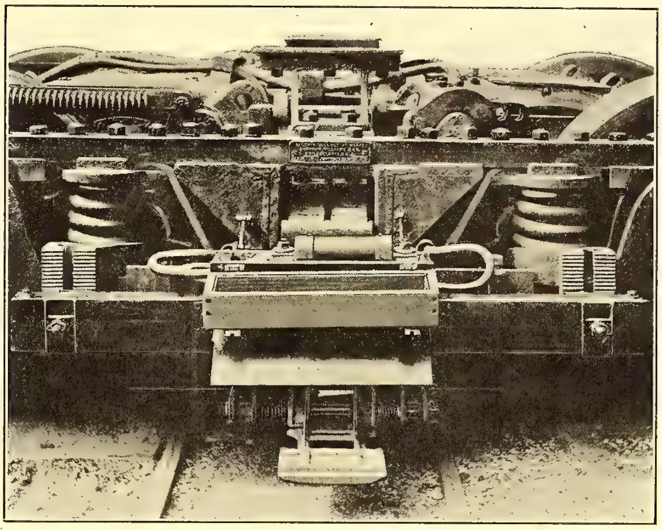


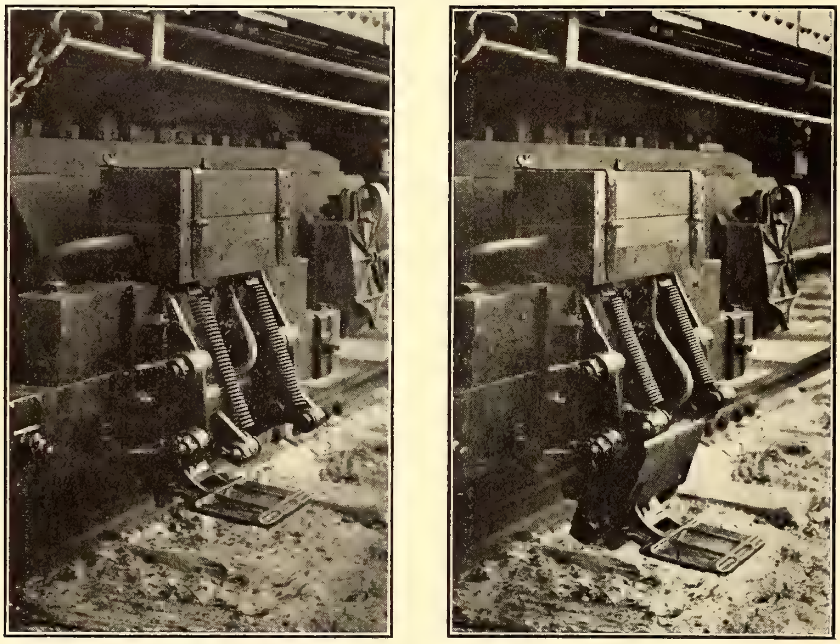
FIG. 14.—THIRD-RAIL SHOE, FUSE AND CONNECTIONS

Trains from the Brooklyn Rapid Transit Company's elevated lines operate over the Atlantic Avenue and Rockaway Beach Divisions by way of Chestnut Street Junction to Rockaway Park. The Brooklyn elevated lines have been for some years operated by the third rail, but the location of their rail is 22¼ ins. outside and 6 ins. above the track rail, while the Long Island Railroad third rail is 26 ins. out and 3½ ins. up. This made it necessary to devise some form of adjustable third-rail shoe which would operate with equal facility over both third rails and be able to change from one to the other at reduced speed without requiring attention on the part of the motorman or train crew. Such an arrangement has been worked out, and patents on it have been applied for by James C. Boyd. It consists essentially of a hinged slipper-type of shoe mounted upon a movable lug which is held in either position by means of coil springs and is actuated by an arm that engages with a stationary cam mounted alongside of the track, in line with the third rail. The movement of the car past this cam in one direction changes the shoe from the inner to the outer low position, while a reverse movement of the car past the cam changes it from the outer to the inner raised position. The appearance of the shoe in the inner position is shown in Fig. 15 on the left and in the outer position on the right. The cam as it appears in the third rail is shown in Fig. 16.

These adjustable shoe equipments have been fitted to such cars of the Brooklyn Rapid Transit Company as are to operate over the lines of the Long Island Railroad.

AIR BRAKES

The cars are equipped with hand brakes and with the Westinghouse quick-service automatic air brake. This brake is of the new design developed from the quick-action brake, and was described quite fully in the STREET RAILWAY JOURNAL for April 22, 1905, in connection with the equipment of the cars of the Metropolitan West Side Elevated Railway Company, of Chicago. Compressed air is supplied to the system by a Westinghouse D-2 electrically driven air compressor on each motor car, controlled by a standard Form "J" governor. This pump has a rated capacity of 24 cu. ft. of free air per minute, and supplies both the air brake and the pneumatic control system, but the brake and the control systems are operated from separate reservoirs.



Inner Position Outer Position

FIG. 15.—ADJUSTABLE THIRD-RAIL SHOE IN TWO POSITIONS

The Westinghouse quick-service brake differs from the standard apparatus in the passenger service in that it has (a) quick serial service application, (b) graduated release of cylinder pressure, (c) quick charging of auxiliary reservoirs, and (d) protection against over-pressure. The quick serial service application is obtained by venting the train pipe air into the brake cylinders, in each service application, in the same way as is done by the quick-action brake in emergency. The time required to fully set the brakes in service is in this way reduced approximately one-half as compared with the usual apparatus. The cylinder pressure can be gradually reduced by any desired amount just as with the old straight air system. This is made possible by a special arrangement of ports in the triple valve, and a partial release of the air from the cylinder is effected by a slight raise of the train pipe pressure by the motorman through the motorman's brake valve.

The quick charging of auxiliary reservoirs is done by providing an additional supply port in the triple valve connecting train pipe on each motor car with the main reservoir, through the feed valve. When the brakes are released, the train pipe and auxiliary reservoirs are supplied from all the main reservoirs of the train, thereby permitting the auxiliary reservoirs to be charged at a rate that makes it impractically impossible to deplete the effective pressure as long as the main reservoirs are supplied by the compressors. Protection against over-pressure is effected by supplying the train pipe with pressure equalized from all the main reservoirs in the train.

By means of the modifications above described, the air brakes are applied more rapidly and the distance required to stop the train is materially lessened. The efficiency of the brake is still further increased by the graduated release feature. The average time required for stopping the train in local service with this device is reduced from 30 to 40 per cent.

The advantage of quick charging of the auxiliary reservoirs is apparent in rapid transit traffic where very frequent stops are necessary. This arrangement makes available the full reservoir pressure at every application, even though the applications be made but a few seconds apart.

The use of the train pipe in service applications also effects a substantial economy in the use of the air stored in the auxiliary reservoirs, and the graduated release is an important factor in reducing the amount of air required for braking, due to the fact that a single strong initial application is usually all that is required to make a stop, the ability of the motorman to gradually reduce the cylinder pressure enabling him to make the stop at exactly the right place. The standard brake usually employed hitherto requires two or three applications.

The method of locally venting the train pipe in service applications enables the quick response of the triple valve to slight reduction in the train pipe pressure.

The main reservoir pressure is from 80 to 95 lbs., and the train pipe pressure is 70 lbs. A conductor's valve is also provided by means of which the train pipe pressure may be reduced by pulling the cord which passes through the car, and may be quickly reached from any part of it.

FIG. 16.—CAM IN THIRD RAIL FOR CHANGING ADJUSTABLE SHOE

All the motor and trailer cars are provided with automatic adjusters which automatically take up the slack in the brake rigging and keep the piston travel uniform throughout the train.

ELECTRICAL EQUIPMENT

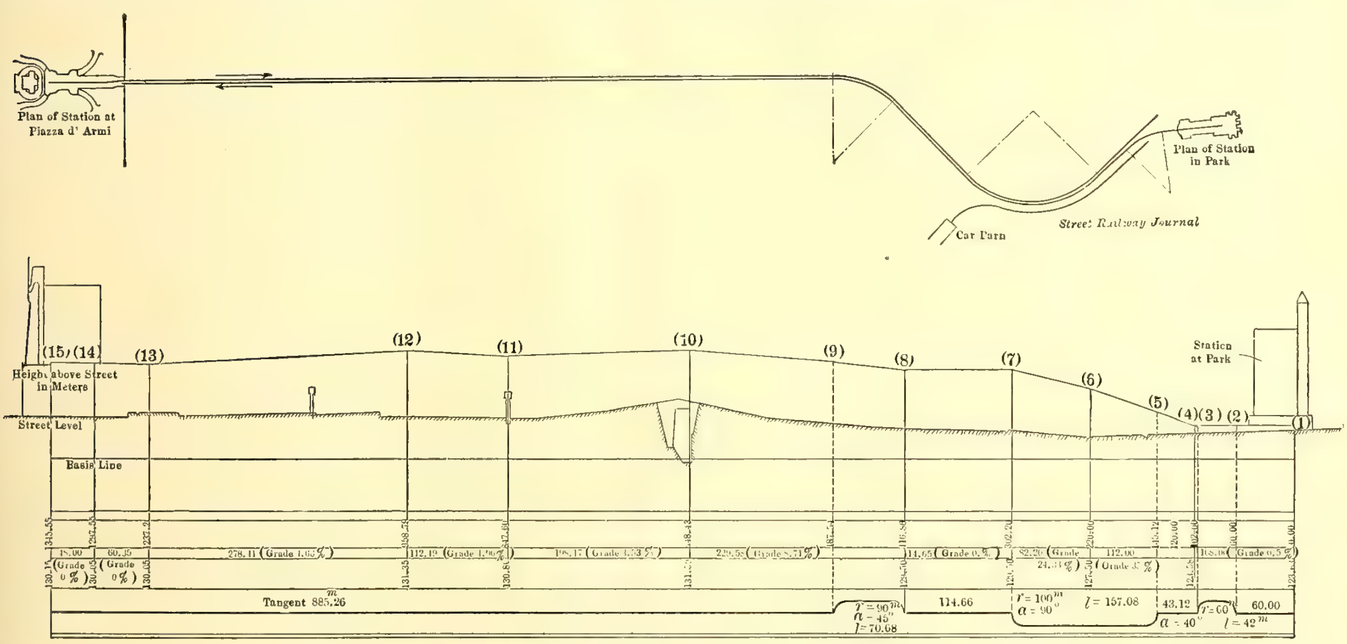
A full account of the electrical equipment of the cars described above, and of the tests by which the capacity of the motors were determined, will appear in the next issue of this paper. Particulars will also be given of the car-wiring and car shops and inspection sheds at Morris Park and Dunton.

THE SINGLE-PHASE RAILWAY AT THE MILAN EXHIBITION

Visitors to the Milan Exhibition are greatly interested in the electric railway which runs from the part of the exhibition situated in the park to the second half in the Piazza

FIG. 1.—A TRAIN OF SINGLE-PHASE CARS AT MILAN

d'Armi. The recent astonishing developments of single-phase traction both in America and Europe have caused much interest in the technical press, and the announcement which occurred recently of Dr. Finzi's separation from the Broschi Gadda Company and his union both for patents and all in-



FIGS. 2 AND 3.—PLAN AND PROFILE OF SINGLE-PHASE RAILWAY FOR CONNECTING THE PARK WITH THE PIAZZA D' ARMI

terests with the Westinghouse Company, of America, makes some account of this railroad exceptionally interesting. The advantages offered by the simplicity of this system have always been apparent, and hard work, close study and experience have produced a brilliant example of technical skill, due not only to Dr. Finzi, but also to the additional practical experience of the engineers employed by the Unione Elettrotecnica Italiana.

Dr. Finzi states that this railway embodies the results of his latest practical experiments with large cars on the Milan-Mussoco road, which started in 1903 and has been carried on with vigor ever since. The essential feature of success is the choice of a low enough frequency, in this case 15 cycles. The modifications introduced by Dr. Finzi consist chiefly in neutralizing the armature reaction by means of a subsidiary winding placed at an angle of 90 degrees with respect to the field magnet coils. The track passes over the streets of Milan, and also crosses the railroad and passes over part of an intervening park. The track is double throughout its entire length, except at the stations, and an auxiliary siding is provided at both stations, which can be made use of for emergency. The plan of the railroad is shown in Fig. 2.

The length of the line is about 1600 yards, the radius of the only curve is 300 ft., and the steepest gradient is 1 in 30. The rails are of the type known as the Rete Adriatica, and weigh 60 lbs. per yard. The return current passes along them, and copper bonds with a section of .1 sq. in. are used. The rails rest upon a viaduct constructed of wood except where the track passes over the railway lines and streets en route, in which case iron is used. Reference to Fig. 3 shows the profile of track and ground of the line as originally built, the only change at present being the substitution of two Siemens bows instead of the single pantagraph type of collector shown in Fig. 4, which type was first installed to avoid danger due to the motorman forgetting to pull down two Siemens bows, if one were placed on each end of the train, and some examination of apparatus became necessary. Due, however, to some difficulty in the patent situation, the ordinary Siemens bows were used, and though they resulted in a fatal accident during the early part of June, they have not yet been replaced.

In Fig. 5, showing the section of the viaduct, the method of trolley wire suspension employed is shown. This line consists of two wires of hard electrolytic copper, .075 sq. in. in area, and the trolley pressure is 2000 volts. The height above ground is 18 ft., and the special metallic elastic suspensions which enable the use of cement to be abandoned are noteworthy. Additional insulation of trolley wire from earth is secured by the span wires, which are fixed to double petticoat insulators on the top of the posts. At the stations at either end of the line all danger to passengers is avoided by carrying the line on the usual hanger, which itself is supported by two insulators attached to a wooden beam.

As it is proposed at the end of the exhibition to carry on experimental tests with voltages in the neighborhood of 10,000, the insulation of the line has been installed with this idea in view. Two horn-type lightning arresters are used at each end.

The generating station, situated under the platform of the Piazza d'Armi station, as shown in Fig. 6, contains a single-phase, 2000-volt alternator built with six poles and operating at 300 r. p. m., this machine being driven by a three-phase motor wound for 3600 volts and bolted to a common cast-iron base. The output of the set is approximately 600 hp. A small alternator, direct coupled to a Langen & Wolf gas engine, is also operated, and these two machines have up to

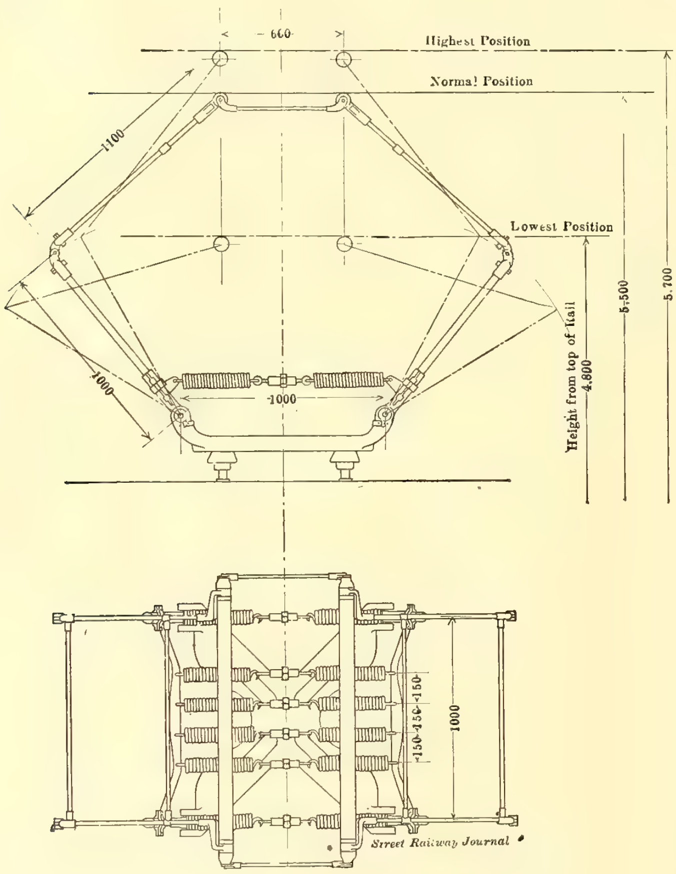


FIG. 4.—ELEVATION AND PLAN OF FINZI COLLECTOR FIRST USED

the present been ample to meet the demands of the railroad. The rolling stock consists of four regular trains, each containing four cars, with two more as reserves (see Fig. 7). The length of the cars is approximately 32 ft., the wheel base being 13 ft. Each train is stated to accommodate 250, but contains only 96 seats, a large space, however, being provided on the end platform to which passengers are admitted. The maximum speed is limited to about 20 miles per hour by the exhibition authorities on account of the light construction of the viaduct, but speeds in the neighborhood of 28 miles per hour have already been attained.

The wiring diagram of the train for motive power is shown from Fig. 8, and it should be noted that the system is easily controlled from either end of the train. This is obtained by dividing the transformer into two parts, one being in the front carriage and the other in the last. The current

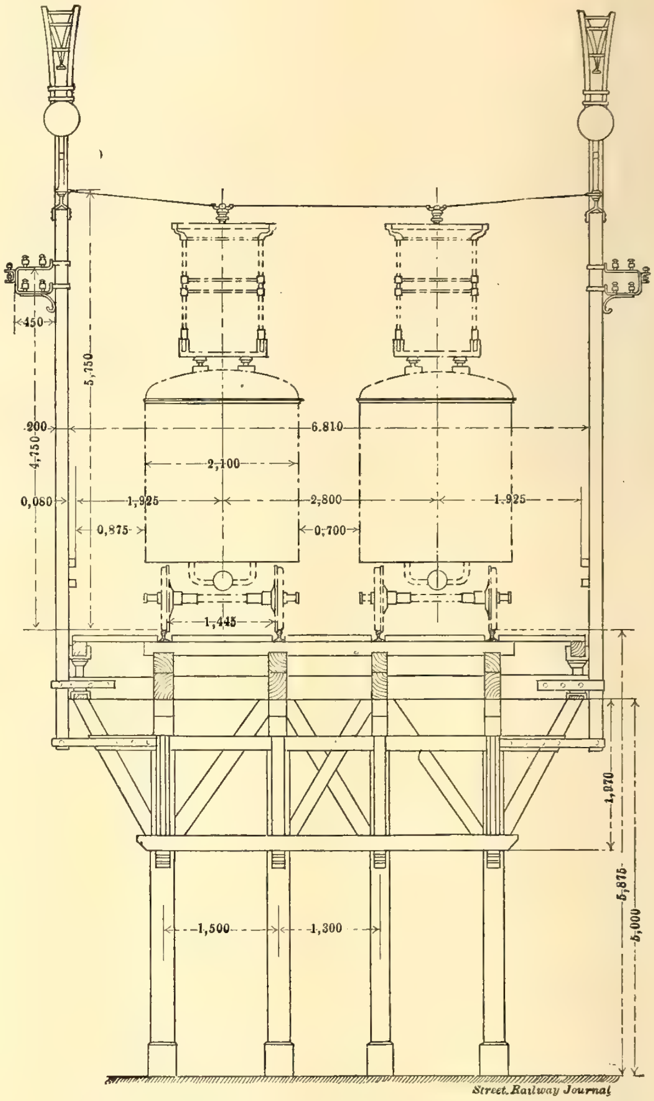


FIG. 5.—TRANSVERSE SECTION OF VIADUCT. DIMENSIONS GIVEN IN MILLIMETERS

enters the collector at 2000 volts 15 cycles, and after passing through the choke coil of the lightning arrester enters the relay of the main switch, which can be operated automatically or by hand. From the relay through the switch, main fuse and then to the primary of the transformer in the first carriage, passing along the train through one of the three wires placed on the roofs of the cars, it then enters the primary of the second transformer at the other end of the train, and finally returns along the track to the generating station. The third high-tension line just referred to is for placing the primary of the first transformer in parallel with the main switches.

The complete equipment of the train consists of six motors, two on each of the end or driving cars, and one on each of the intermediate or passenger cars, these six motors being arranged in groups of three for each transformer. The motors start on the first position of the controller, which gives approximately half normal voltage, which Dr. Finzi states is in general the best starting pressure.

Following the position of the controller handle, from 1 to 7, after the first application of half-normal pressure, each step of the controller adds 30 volts to the secondary, thus

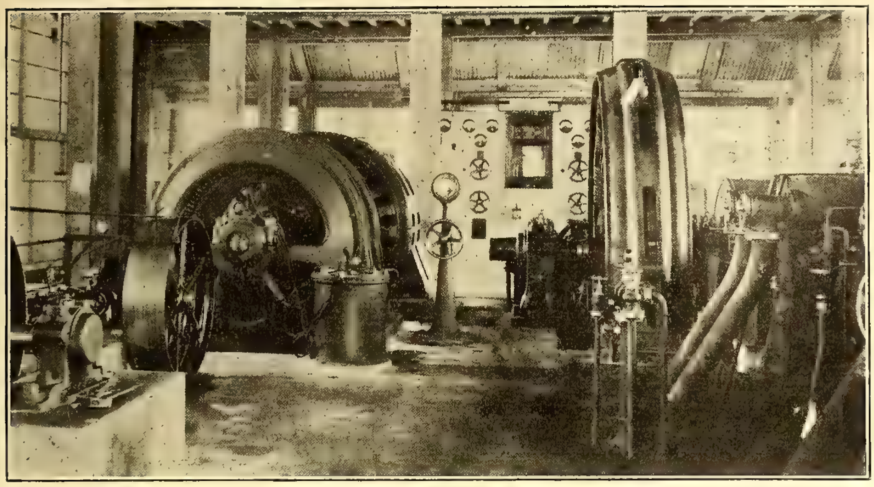


FIG. 6.—POWER STATION AT PIAZZA D' ARMI FOR SINGLE-PHASE LINE

bringing the voltage up from 180 to 360 volts, which for the three motors in series means an average value of 120 volts per motor. The reversal of the motors is obtained in the

as long and narrow as possible, so as to improve the commutation. It is noteworthy that the commutation segements, which are constructed of very thin copper plates, are connected to the conductors without any resistance. The armature is built up with steel stampings containing altogether sixty-five conductors in slots.

On first inspecting the car the visitor is impressed by the size of the controller, but the currents handled are in the neighborhood of 700 amps., and ample size is imperative. The design of the controller is adapted to enable either continuous or alternating current to be employed. To pass from one position of the controller to the next without breaking the circuit and without causing excessive current is taken care of by the provision of a choking coil inserted during the moment of change of contact.

The acceleration of the motor at starting is stated to be one-half foot per second, and reference to Fig. 10 will show that the starting always takes place on a slight up-grade. The operation of the motor is apparently extremely satisfactory, the commutation being very good. It is, however, some-

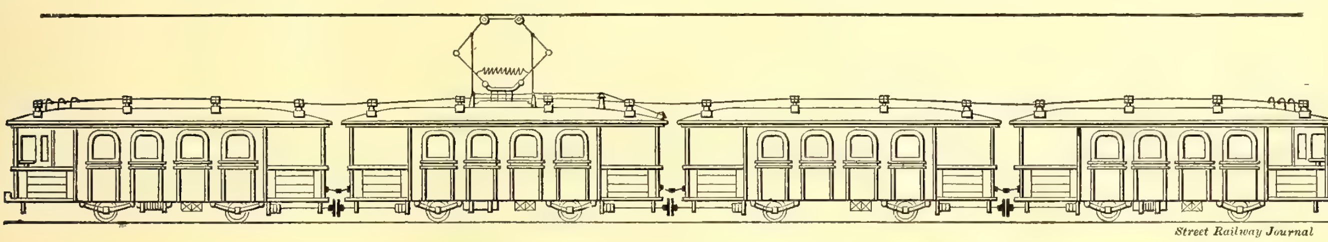


FIG. 7.—A COMPLETE TRAIN ON THE MILAN EXPOSITION RAILWAY

same way as with the direct current. The motor and transformer is shown in Fig. 9. The motor is provided with laminated poles and compensating winding for the production of the flux at right angles to the field. The effect of this is

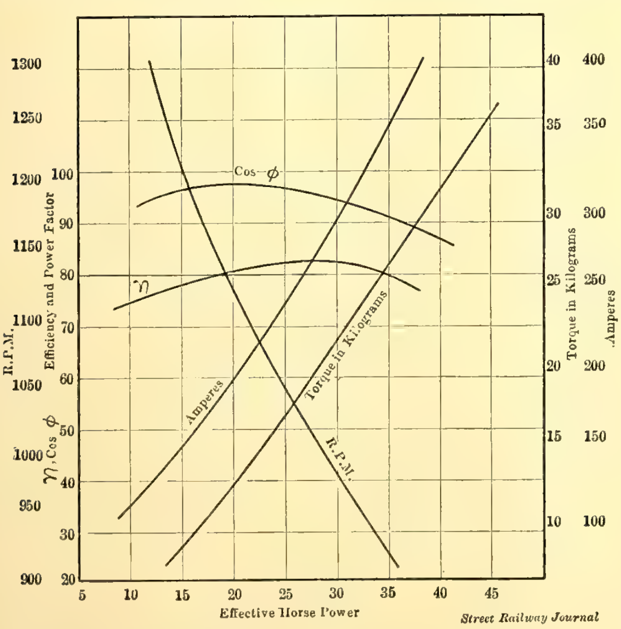


FIG. 10.—CHARACTERISTIC CURVES AT 100 VOLTS

to neutralize the armature self-induction and increase the power factor. The brushes are the same in number as the poles, viz, six, and are carried on rigid rings. They are made

what too short a time for any serious difficulties to arise, but by the time of the Engineering Congress in September some valuable experience should be available.

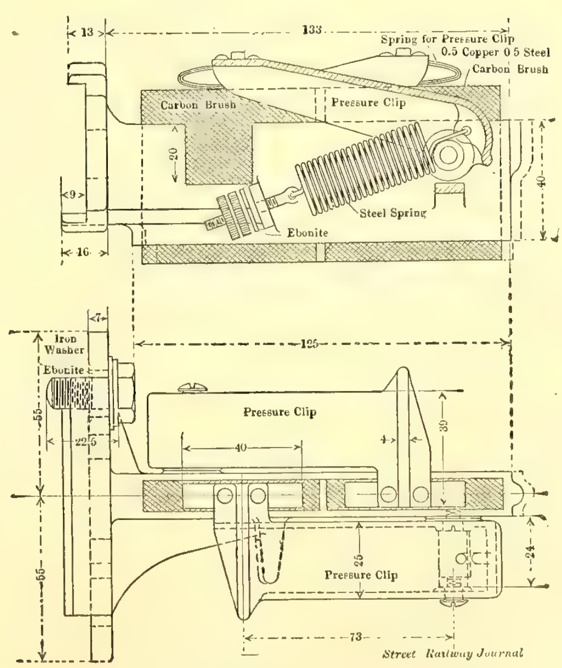


FIG. 11.—DETAILS OF BRUSH-HOLDER

The details of brush holders, dimensions of brush, pressure clip, etc., are shown in section and plan in Fig. 11.

Details of the Finzi pantagraph collector are of great interest and are shown in Fig. 4. Fig. 10 shows characteristic curves of the M. F.-25 motor used on this railroad, and thoroughly explains the principles underlying its design. Fig. 11 shows the stator of this motor.

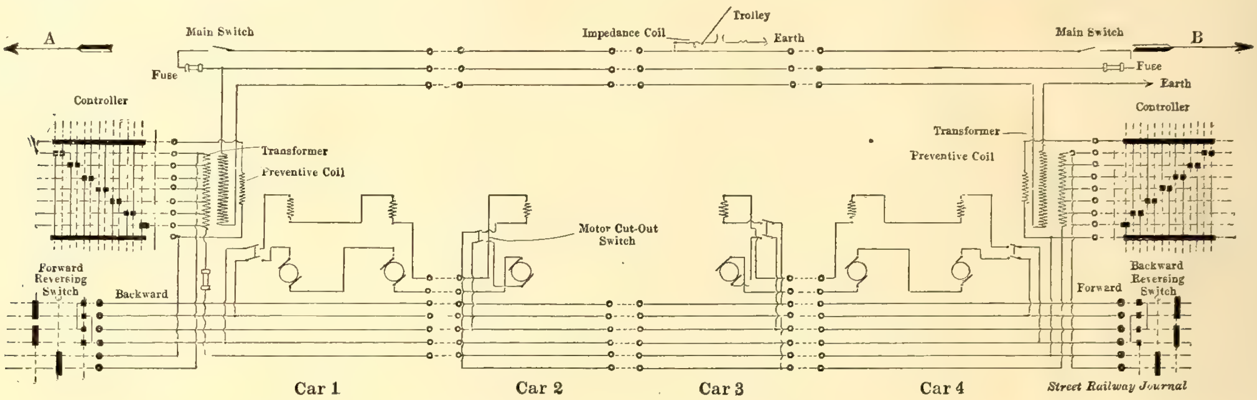


FIG. 8.—DIAGRAM OF TRAIN CIRCUITS

The system was laid down for a three minutes' service, and this is at present easily maintained. This railway, though slightly less than a mile in length, offers an interesting example of the latest development of European practice with this type of motor.

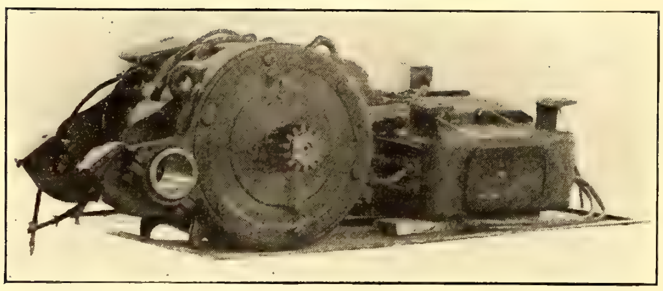


FIG. 9.—SINGLE-PHASE MOTOR AND TRANSFORMER

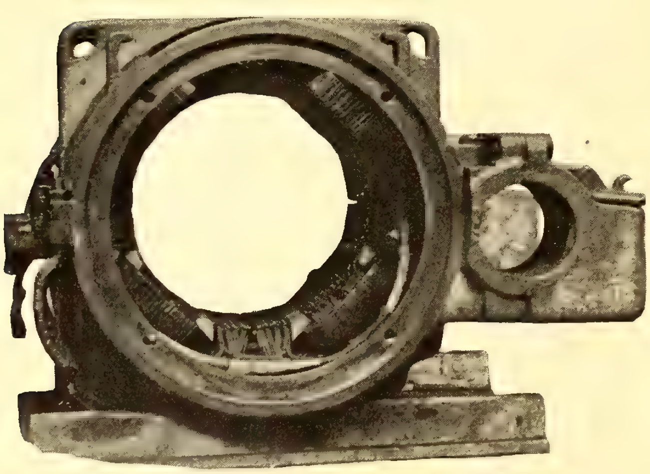


FIG. 11.—STATOR OF SINGLE-PHASE MOTOR

The United Railways (of St. Louis) Band, composed of about sixty musicians employed on the different divisions of the system, was entertained by General Manager McCulloch one evening recently in the hall on the third floor of the headquarters building. The band practices in the hall every Tuesday and Friday evening, and employees of the company, with their wives and families, assemble to enjoy the concert.

PROFIT-SHARING TO BE TRIED IN ALBANY, N. Y.

The United Traction Company, of Albany, N. Y., is about to inaugurate a profit-sharing plan, the beneficiaries of which will be the motormen and conductors only. By the new scheme the men will have a chance to participate in the distribution of 75 per cent of $75,000, and it is thought that the men who, because of their record, are entitled to participate in this fund, ought to make from 10 to 15 per cent of their annual salary by the new scheme, averaging between $50 and $90 each.

Vice-President Culver announced that, beginning Aug. 1, an individual record for all motormen and conductors would be established, which would in effect amount to a profit-sharing arrangement. The personal injury expenses of the company for the last year was approximately $75,000, which represented 1,500,000 fares. This expense was largely due to the carelessness of the car crews, and it is proposed to encourage the men to be more careful. Therefore, it is proposed to give to each man who at the end of the year has a clean record his pro rata share of the 75 per cent of what they save by their carefulness, using the $75,000 as the basis of estimate.

The company will establish a board of review, on which the men will have a representative, which will from time to time decide who is entitled to participate in the fund. All men start Aug. 1, with a clean record and on an equality. If, by care, attention to passengers and keen supervision of the company's property, a man closes the year with a clean record and without an accident he will be placed on the roll to participate in the profit-sharing fund, which amount will be paid to him at the end of the year in cash. Those whose records are not clean will not participate. By this scheme the company hopes to make the matter of carefulness a sort of mutual affair and those who deserve it will receive their reward. It will undoubtedly result in more care and a lessening of the annual expense to the company, every man thus constituting himself a policeman to guard the company's property and being paid extra for his services. This proposition comes as a voluntary offer from the company, and shows that it is prepared to meet the men more than half way. The men get 22 cents an hour and average between $600 and $800 a year. There are about 500 men employed by the company in Albany and Troy who will be entitled to participate in the new scheme.

A special election will be held in Seattle, Sept. 12, to vote on the proposed municipal ownership of the street railroad system, outlined by the city engineer, at an estimated cost of $7,579,980. A bond issue, to be authorized later, is part of the program.

REGENERATIVE CONTROL AND THE BOW COLLECTOR

BY GERALD HOOGHWINKEL, M. I. E. E.

The latest series of accidents in England, mostly due to the use of the hand brake as a working brake and of the magnetic or the electric rheostatic brake as an emergency brake, have once more drawn attention to the shunt or compound motor as a tramway motor.

There cannot be, or rather there should not be, two opinions as to the question whether a shunt motor is the traction motor "par excellence." Automatic and sure braking, constant and fixed speed for every definite position of the controller, are and have always been recognized as desirable qualities, and their early introduction has only been hampered by constructive difficulties, long since overcome. As early as 1896 the writer was instrumental in introducing them in the town of Essen, where fairly heavy grades are constantly met. Two years afterward they were replaced by series motors, as there was considerable trouble due to sparking at the commutator, and piercing of the field coil insulation due to the higher pressure between the coils. These constructive defects have long since been remedied by carbon brushes, auxiliary poles and better insulating materials, and the present regenerative motors on the market run perfectly. Mr. Raworth in England has added various improvements which in the writer's mind have completely swept away the causes for distrust, generally based on lack of initiative and the fear of the new, or apparently new. The series parallel controller has done away with the only drawback to the constant-speed motor, and the speed regulation leaves nothing to be desired.

In his present practice, in addition to tramway work, the writer has to give considerable attention to electric winding problems, and the electrical driving of rolling mills. Although different in detail, this class of work presents sufficient analogy with tramway work, and still in no case are series motors thought of.

These applications of electricity being of more recent date, the shunt motor, or its equal, the induction motor, was adopted at once as the only motor suitable for this work, and it needs only the correct appreciation of its qualities to enable the shunt or compound tramway motor to oust the series motor, even on quite flat lines.

Two other points should be at once considered, however, in connection with the wholesale introduction of the regenerative motor:

(a) A storing and equalizing device at the power station.

(b) A collector which does not de-wire.

The first condition has been at once recognized in the application of the shunt motor before mentioned, and batteries, the equalizing booster, and lately the Ilgner flywheel equalizers, have been introduced. The usefulness of the storage battery is not generally recognized even yet. To enable the full benefit to be derived from regenerative control a battery with a reversing booster, or in some cases a flywheel booster, should be installed in most cases. Of course with the present series motors a battery or its equivalent, at least in all smaller undertakings, is desirable.

The second condition is even more important, especially when considered in connection with the recent brake accidents. To be effective the regenerative equipment must be in constant communication with the source of supply, and the trolley wheel has an unenviable reputation of leaving the wire at the moment its connection is most urgently required. On other grounds the writer has frequently advocated its use, and being himself very much in favor of the bow system under most circumstances, and having constructed several continental lines on that system, he has tried on several occasions to elicit an opinion as to its merits from our electric traction specialists. The answer has invariably been an evasive one, with a slight inclination toward hostility while referring to a particular antiquated and obsolete system in the Isle of Man. Some of these specialists drew appalling pictures of molten grease dripping from the overhanging bow upon the defenseless passengers when used with the double-decked cars employed in England. But double-decked cars are used in Sheerness, and the writer has not yet heard of these calamities. Others compared the graceful (sic) trolley pole to the, at a distance, almost invisible bow. Objections from an engineering or commercial point of view could not be obtained, and the only thing was to equip a line and invite criticisms.

The first equipment of this system of overhead collection in Great Britain was laid down by the writer for the Sheerness electric tramways, one of the affiliated companies of the Electrical Power Distribution Company, Ltd., and has proved a complete success during the three years it has been in operation. This result was of course to be expected, as fully one-third or more of the electric tramways on the continent are constructed on the bow system, and even all the latest undertakings, i. e., Cologne, Amsterdam and Vienna, etc., have adopted it after a careful inspection of its merits.

The line has been built and runs to every one's satisfaction, and particularly to that of the Board of Trade. Some trouble was experienced at first through the breaking of several standards which had been made of cast-iron instead of steel as specified. As the strain on these standards at certain points, as on curves, was somewhat more severe than with an ordinary trolley, this could have been expected. The standards, however, have now been changed and converted to an inside spring pattern like our ordinary trolley standards; the first had an outside ring fixed on the top.

The latest report from Sheerness, which should be especially noted with reference to the overhead gear, is as follows:

> During the whole time the tramways have been running (over three years) no repairs have been necessary to the overhead equipment, beyond renewals of section insulators, strips and about half a dozen span wires.
>
> The trolley wires are still in very good condition. The life of an aluminum bow strip is, roughly, about 5000 running miles; these cost 6s. 6d. to renew, without allowing for the old strips which weigh about 3 lbs., which fetches 2s. 6d. as scrap.

In view of the successful operation of this line, the writer wishes to go a step further, and strongly advocate the bow system for all large cities where many crossings and pieces of complicated overhead construction are to be met, and as a matter of course for all interurban lines where the speed exceeds 20 to 25 miles per hour, and where no third rail is used. If we remember that according to the Board of Trade statistics 80 per cent of all accidents on electric tramway lines may be ascribed to the trolley leaving the overhead lines, not only causing much damage to the overhead gear, but often resulting in serious loss of life, and that this contingency is of course impossible with the bow system, that advantage alone should be considered sufficient for its general adoption.

But there are other more visible advantages. As the contact is able to displace itself laterally along the bow, it is clear that the contact wire need not follow in curves the center of the track, and needs even less points of suspension and poles than the side-trolley system. This does away with many pull-off and hangers, etc. There are no frogs and switches as a matter of course, and this rids us from the most objectionable overhead device. The pressure (12 to 15 lbs.)

of the light bow, which need not be protected from jumping off the line, against the latter is very much less than with the trolley. Therefore the entire overhead equipment has less points of suspension and the material used can be much lighter, and therefore less unsightly or objectionable, than with the trolley. This advantage should be of prime importance in our big cities with their large squares where several lines cross. The smaller number of poles and the absence of frogs and crossings also reduces the first cost and maintenance of the line.

The contact surface of the bow consists of a grooved aluminum strip, greased if necessary, and the wear and tear on the trolley wire is therefore, and has been proved to be, much less than with the trolley wheel. The trolley wheel requires higher spring pressure and pounds the wire with considerable force at the points of suspension, especially at the curves and crossings. On the contrary the bow, with much less pressure, runs smoothly, and shows no or very little sparking. The trolley wire will last much longer when using the bow, and the writer has had ample occasion to verify this statement on lines like those of Dresden and Budapest, where the same trolley wire has now been in use for over twelve years.

The effect of the trolley wheel, especially on sharp curves, is an increased wear on the sides of the wire, caused by the flanges of the wheel. This wear and tear is reduced to a minimum by the use of the bow, which only causes a slight wear on the under side of the wire, and if the bow is used with a lubricating groove, is hardly noticeable even after many years. The writer found upon examination of some wires used in Dresden that the section after four years' use on one of the busiest lines represented still 96 per cent of the original section. This removes a source of danger of breaking wires at the curves, which need careful and frequent inspection where a trolley is used.

Lubrication of the bow-groove has the additional advantage of minimizing the noise. Moreover, it is possible to use on curves a secondary contact wire, which can be easily renewed without much cost.

The overhead line has to be slightly zigzagged in order to insure even wear on the bow surface, but the contact strips cost very little (4s. or $1) to renew (every six weeks). If sufficient care is taken to fix the spring pressure at the proper figure most suitable to the overhead equipment, and reasonable precaution is taken by the man, it will be found that the maintenance of the overhead equipment and bow gear is less than on the trolley system.

Roughly speaking, therefore, the bow system possesses the following features:

(a) Safety at any speed, especially with regenerative control.

(b) Easier handling.

(c) Lighter, cheaper, and less unsightly overhead construction.

(d) Less wear on the contact wire.

The writer is well aware that the above notes contain nothing that is absolutely new to street railway engineers, but strange to say, the many advantages of the bow system have never been properly discussed or shown either in England or America.

The introduction of the shunt motor as the proper tramway motor should go hand in hand with the bow-controller.

It is said that plans are being made for electrifying the mountain division of the Mexican-Vera Cruz Railroad, power to be generated near Cordova.

A WIDE-AWAKE PURCHASING AGENT AND HIS METHODS*

BY CHARLES T. DOERR

Purchasing Agent and Superintendent of Stores, Birmingham Railway, Light & Power Company, Birmingham, Ala.

The subject assigned to me is one upon which a great deal might be said. I do not consider it necessary to go into the minor details, but will give the gist of what should be the qualifications of a buyer who is modern and up to date.

The successful operation of any business, whether it be private or a public corporation, is dependent upon the attention paid to details, not the least of which is the purchase of material. I have followed closely for a number of years the proceedings of the Street Railway, as well as the Accountants' Associations, but I do not find that the work of the purchasing agent has been given the attention which the importance of the position deserves. The handling and accounting of stores is the source of much study and discussion, but the cost and quality of the material and supplies delivered into the companies' storerooms and barns, which is of equal importance in my mind, seems to have been overlooked.

The buyer at the present day is recognized as an indispensable member of the cabinet of every progressive business man, and from the very nature of his position comes into touch with details of the entire property that no other department head ever sees, unless he is sufficiently interested to look for them. A question often asked is: What are the characteristics of a good purchasing agent? I will say that in addition to the requisite of intelligence and common sense should be added, most emphatically, politeness and patience. A purchasing agent must be from start to finish a gentleman. No matter how busy, no matter how worried, every caller, even though he be the twentieth man, should be treated courteously and affably. Traveling men are very clannish, and it is a matter of policy to have the good will of every man on the road. It sometimes means many dollars to the company. It does not follow that he should be a "hail fellow, well met" with every salesman who comes into the office. Intimacy is to be avoided even more than boorishness. It seems almost needless to say that absolute honesty and unswerving integrity, requisites to any position, are a hundred times more necessary in this. Trickery and deceit, which some buyers consider clever work, may now and then secure a desirable price, but the practice is bad and the results are never satisfactory. Be frank and fair, and—as Mr. Roosevelt says—give every one a square deal.

The tendency of modern times is toward specialism, and it is natural that success will follow constant study of any exclusive work, but the purchasing agent must be a specialist of specialists. He must be an encyclopedia of deep knowledge and useful information. Requisitions for supplies may include articles from a carload of car wheels to a barrel of flour, from a box of bank pins to a season's supply of gas ranges. I have even bought monkeys. His information as to prices and bases of supply should be so systematically compiled as to be at his hand in any emergency. His catalogue file must be carefully arranged, as it bears the same relation to him as a library does to the student. His files should contain tables and statistics of all kinds, not omitting a good engineer's handbook. Daily attention should be given to market reports and the influences which affect prices carefully studied. Causes seemingly remote may have effects which are directly felt in the operating expenses, and it is only by the closest attention that these effects may be dis-

* Paper Read Before the Newman Properties' Association at Knoxville, Tenn., in June, 1906.

counted. I have found the New York "Journal of Commerce" to be of great help to me in my work, and I am sure that the subscription price has been saved many times over.

In the purchase of material a desirable price is not the only consideration—any schoolboy can place an order with the lowest bidder. Hence it is necessary that the purchasing agent be familiar with the specifications governing a vast assortment of supplies. The grading of lumber should be learned and applied. The distinction between "A" and "B" grade glass should be understood. It is a serious matter to pay for one and receive the other. The adulteration of white lead is a common matter, but the live buyer should be able to apply a simple test and satisfy himself that he is getting pure lead if he pays for it. In the purchase of insulated wire, although the weights are now guaranteed, it is necessary that the specifications be carefully scrutinized to avoid paying for cotton and rubber at the price of copper. This is of even greater importance in the purchase of underground cable, which requires the closest study to determine the best material at the lowest price.

The thousand and one articles used by a public corporation have each their characteristics, which must be understood to enable the buyer to make an intelligent selection. Thus it goes through the entire list. Nothing is taken for granted and everything must be inspected and tested and weighed.

I want to say a few words relative to the purchase of material from out-of-town points. While it may relieve the accounting department of a great deal of work, I believe the prepayment of freight, except in particular instances, is not a sound business policy. The handling and approval of expense bills enables the purchasing agent to check the rate and classification, and you would be surprised to know the number of errors made by transportation companies, and always in their favor. I have seen trolley poles classed as electrical machinery and billed under first-class rates. The purchasing agent should also study transportation lines so that he may direct the routeing and take advantage of differentials, or make such selection as he may find desirable for more than one reason. Economical purchase made under careful conditions does not end his responsibility. He should keep in touch with the man using the material, whether it be the station engineer, the master mechanic, or the track foreman, and through close attention, study for himself the efficiency of the material he has purchased, and not depend blindly upon the judgment or selection of others who may be more or less prejudiced.

The routine of a well regulated purchasing department is a matter of personal preference. We find that a triplicate order system, forwarding duplicates to the auditor, and filing the third copy numerically, works out in a very satisfactory manner. All bills and invoices are sent direct to the purchasing agent, and after approval are numbered, recorded, and after notation on office copy of order, are forwarded to the auditor with evidence of delivery attached.

I have endeavored to show the complex nature of this position and how necessary it is for one to give close attention and careful study to every detail in order to make his administration a success and lend a hand in the reduction of operating expenses.

There has been a steadily increasing demand for sightseeing cars in San Francisco, because of the number of tourists visiting the city to view the ruins. With four special cars assigned for this service, carrying nearly 250 people, people are frequently turned away to the regular cars.

TESTING HIGH-TENSION INSULATORS

To test high-tension insulators under working conditions, the Insulatorwerke A. G. in Pankow, near Berlin, recently erected an experimental line equipped with insulators made by the Ambroin Werke (Kleinsteuber patent).

A description of this line should be of interest, since a pressure of 100,000 volts is used, and furthermore in addition to the transmission line in the open a part of the line is carried indoors and under conditions which could scarcely be called favorable. At two points in particular, special care was required, namely, where the conductors passed through a masonry wall and a doorway, respectively.

The line commences in a room containing a 20-kw transformer built by the British Westinghouse Company and having a ratio of 2:1000. In the forepart and at the right is the switchboard for the transformer. It is equipped with a two-pole switch, an overload circuit breaker, a hot-wire voltmeter and a hot-wire ammeter, all in the primary circuit. Although the voltmeter is connected in the primary circuit, the scale reads the secondary voltage. The ammeter is fastened at the side of the switchboard. The primary current

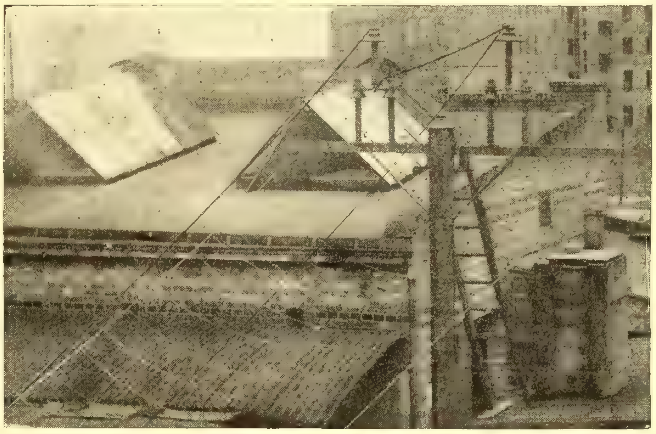


FIG. 1.—ARRANGEMENT OF INSULATORS DURING TEST

measured 18 amperes with the secondary on open circuit at 100,000 volts.

In front of the switchboard is a regulator similar in construction to a railway motor controller which permits the variation of the pressure in steps of 10,000 volts. The sudden jumps from one voltage to the next higher, which were necessary evils with this regulator, often caused surges which would operate the breaker in the primary circuit. On account of these annoyances this regulator was replaced by an induction regulator which permits a gradual change from the lowest to the highest voltage.

The line conductors, which consist of bare zinc plated copper wire 1.5 mm in diameter, are carried through the wall above and at the left of the transformer. The entry consists of an Ambroin plate 1000 mm x 1000 mm x 25 mm through which are passed two Ambroin tubes, 60 mm outside diameter, 26 mm inside diameter, 600 mm long and 500 mm between centers. Round metal rods are fastened in these tubes with Ambroin sleeves, the ends of the rods being provided with clamps for connection to the line conductors. There is also a hemp string net strung underneath the line throughout its length to catch broken conductors and prevent them from reaching the ground. (The net was purposely made of non-metallic material to prevent condenser effect.)

The conductors next pass through a narrow floor, and are here carried upon Ambroin insulators supported upon wall brackets. Passing through the entry in the door the line

reaches the open air. This entry is constructed like the one in the transformer room, except that the conductors are placed side by side instead of one above the other. The last stretch of the line passes over the factory court yard and ends on a wooden pole five meters high, upon which are mounted the insulators to be tested. The insulators shown in the illustration do not belong to the so-called standard types, but were special forms used only in the first few tests.

From Fig. 1 it is seen that the connections are so made that the insulator at the left is subjected to the full working line voltage, while the one at the right, in this case, serves only to insulate the incoming line. The four supports under the insulators, which are also made of Ambroin, serve to increase the insulation to the pole or ground or to insulate the insulator from the pole. There is also an arrangement whereby a considerable number of insulators can be set upon level ground and tested. For this purpose wires are led from the main line to the various points in the factory court yard where insulators are mounted to be tested under all sorts of weather conditions.

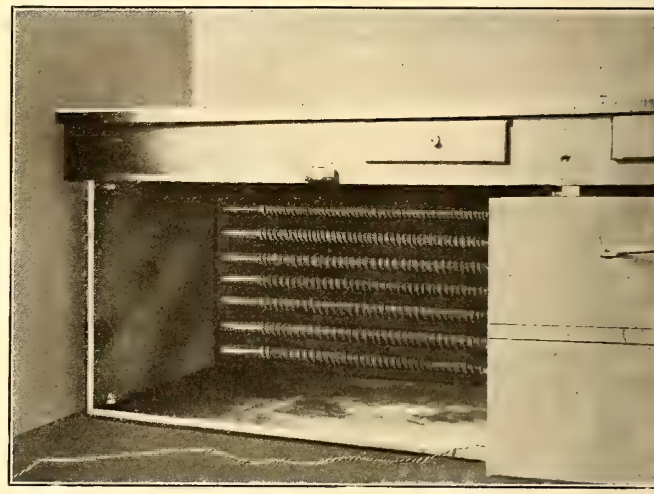
The first tests were limited to simple trials made to determine the safety and reliability of the installation. These consisted of impressing full voltage (100,000 volts) upon the line for one hour each day for three successive days. On the first day there was a heavy rain and on the two following days there were big snowstorms, nevertheless there were no noticeable disturbances. The only trouble experienced was caused by the opening of the circuit-breaker, when the voltage was raised too rapidly. Since the voltage was varied in steps of 10,000 volts, an extra rise in current accompanied each advance of the voltage. When the operator did not pause about 15 seconds on each step the surges were so great as to cause the circuit-breaker in the primary circuit to operate. When care was taken to pause at each step the disturbances were greatly reduced, but since the installation of the induction regulator there has been absolutely no sign of trouble from this source. The extra rise in potential could be detected along the line by a sharp clicking sound, so that the observer stationed in the factory court yard could follow the adjustment of the regulator from step to step without being in communication with the attendant in the transformer room. At 40,000 volts there is a perceptible corona about the wires and a humming sound which denotes the passage of electricity into the atmosphere. At 100,000 volts there is a corona at the points where the conductors pass through tubes in the entry plates. The transformer terminals, and, in fact, everything connected to the line are surrounded by a glow of light. After the reliability of the installation had been proven, by the preliminary tests, the actual tests upon insulators were begun. The testing plant has now been in almost daily use for six months and works as well now as the first day it was put in service.

FIG. 2.—FORMATION OF CORONA AT HIGH VOLTAGE

Fig. 2 shows one of the insulators mounted upon the wooden pole while being tested with 100,000 volts. The corona on the conductors is sharply outlined against the dark night sky and many points of light can be seen radiating from the edges of the insulator as well as at the point where the insulator is joined to the support. The successful operation of this testing plant has proved that an installation operating at 100,000 volts, when properly insulated, is perfectly feasible even for conductors carried indoors.

AN INEXPENSIVE ARMATURE OVEN

In the accompanying illustration is shown an inexpensive oven for baking armatures and fields in use in the shops of the Clinton Electric Railway Company, Clinton, Ia. The oven was constructed under a work bench to economize space, and is 4 ft. 6 ins. long, 2 ft. 6 ins. high, and about 3 ft. deep. It is lined with asbestos covered with sheet iron. In the rear are seven coils consisting of No. 7 wire wound helically on 1¼-in. gas pipe covered with asbestos. A glass in one side of the oven permits a thermometer on the inside to be read. With the present wiring the temperature rises to about 220 degrees and then remains constant.



ARMATURE OVEN BUILT UNDER BENCH

TRUCKS FOR THE HUDSON COMPANIES

Referring to the notice on page 145 in the Street Railway Journal for July 28, entitled "Trucks for the Hudson Companies' Cars," it is interesting to add that the contract for the first 100 trucks ordered by the Hudson Companies was placed two months ago with the Baldwin Locomotive Works, of Philadelphia. Some time subsequent to that date an additional order was placed with the American Locomotive Company, but for trucks not required until some time next year; therefore, the tunnels will be opened and operated with Baldwin trucks.

The Baldwin Locomotive Works contract with the Hudson Companies calls for fifty motor trucks and fifty trailer trucks. The details of these trucks conform to the data in the article referred to above. They are the regular Baldwin double-bar equalized M. C. B. type, and embody also a special form of center casting arrangement designed by L. B. Stillwell, consulting engineer of the Hudson Companies, with a view of facilitating the removal of cars from trucks in case of accident. The motor-truck wheels are 34¼ ins. in diameter, and of the steel-tired, cast-steel, center type, with Doyle-Brinkerhoff extended hubs. The trailer truck wheels are to be 30 ins. in diameter, and of the solid forged and rolled-steel type. Both types of wheels are to be made by the Standard Steel Works.

STANDARDIZATION OF TREAD AND FLANGE OF WHEELS

The Committee on Standardization of the American Street and Interurban Railway Association has issued a circular on tread and flange of wheels upon which data are desired. This circular is being sent out by Secretary Swenson, to whom all replies should be directed.

The active work of making the standards devolves upon the Engineering Association committee. This committee has decided to devote its attention at present to the standardization of brake-shoes, journals and journal boxes, tread and flange of wheels, and rails for street and interurban railways. Considerable work has been done along all four lines of standardization, but the present communication relates only to the subject of tread and flange of wheels. It should be especially noted that the data sheet asks for sketches with dimensions. It is quite essential to the latter work of the committee that the material asked for is prepared and sent in by the various companies. The information obtained will be carefully collated by the engineering committee, and together with other material upon this subject, will form the basis of the report of this committee on the standardization of brake shoes. The letter is signed by the following committee members: H. Wallerstedt, chairman; H. A. Benedict, W. H. Evans, H. B. Fleming, J. M. Larned, F. H. Lincoln, and Paul Winsor.

American Street and Interurban Railway Association
60 Wall Street, New York

Office of the Secretary

American Street and Interurban Railway Engineering Association
Committee on Standardization
Flange and Tread of Wheels

Data Sheet No. 10 August, 1906

1. Company ....
2. City .... (3) State ....
4. No. miles of track (a) Single........(b) Double........(c) Total........
5. Gage of track.......... 6. Average speed of cars..........
7. Maximum speed of cars (approximately)..........
8. Single-truck cars
   (a) No. operated ....
   (b) Weight of heaviest car complete (without load)..........
9. Double-truck cars
   (a) No. operated..........
   (b) Weight of heaviest car complete (without load)..........
10. Kind and approximate number of wheels.

A. Motor trucks	Motor Axle	Pony Axle
Chilled cast iron	....	....
Cast steel	....	....
Solid rolled steel	....	....
Solid forged steel	....	....
Steel-tired wheels	....	....

B. Motor-car trailer trucks.	C. Trailer-car trucks ....
Chilled cast iron..........	Chilled cast iron..........
Cast steel	Cast steel ....
Solid rolled steel..........	Solid rolled steel..........
Solid forged steel..........	Solid forged steel..........
Steel-tire wheels	Steel-tire wheels ....

11. What is the diameter of the wheels when new?
   Motor trucks (a) Motor axle..........(b) Pony axle..........
   Motor-car trailer trucks..........
   Trailer-car trucks ....
12. Flange.
   A. Give height of flange when new on cars operating over
   (a) Urban lines.......(b) Interurban lines.......(c) Both urban and interurban lines ....
   AA. Give features limiting height of flange when new on cars operating over
   (a) Urban lines ....
   (b) Interurban lines ....
   (c) Both urban and interurban lines..........
   B. Give thickness of flange when new on cars operating over
   (a) Urban lines.......(b) Interurban lines.......(c) Both urban and Interurban lines ....
   BB. Give features limiting thickness of flange when new on cars operating over
   (a) Urban lines ....
   (b) Interurban lines ....
   (c) Both urban and interurban lines..........
13. Tread.
   A. Give width of tread when new on cars operating over
   (a) Urban lines.......(b) Interurban lines.......(c) Both urban and Interurban lines ....
   AA. Give features limiting width of tread when new on cars operating over
   (a) Urban lines ....
   (b) Interurban lines ....
   (c) Both urban and interurban lines..........
14. Flange and Tread.
   A. Give total width of flange and tread combined on cars operating over
   (a) Urban lines......(b) Interurban lines......(c) Both urban and interurban lines ....
15. Outline Sketches.
   Give outline sketch with dimensions of flange and tread when new of cars operating over
   (a) Urban lines, (b) Interurban lines, (c) Both urban and interurban lines.
   Give outline sketch with dimensions showing features which limit dimensions of flange and tread of wheels, of cars operating over
   (a) Urban lines, (b) Interurban lines, (c) Both urban and interurban lines.
16. Suggested Standard.
   Kindly send dimensioned sketch showing what you consider would be a good standard for flange and tread of wheels, on cars operating over
   (a) Urban lines, (b) Interurban lines, (c) Both urban and interurban lines.

Remarks: ....

Signed ....
Title ....

Notice.—This information blank is sent you in duplicate form. Please fill in the information asked for at your earliest convenience, and return one copy to Bernard V. Swenson, secretary American Street and Interurban Railway Association, 60 Wall Street, New York City. You will receive a bulletin later announcing the results of this investigation.

NEW HAVEN INSTRUCTING MOTORMEN FOR ITS ELECTRIC SERVICE

A bulletin has been issued from the electrical department of the New York, New Haven & Hartford Railroad Company, stating that electrically equipped trains will be run from the Grand Central Station in New York to Stamford at an early date, and that the motormen, who will supersede the locomotive engineers, will be paid $3.60 per day for ten hours' work and their helpers will be paid $2 per day for the same time.

Engineers and firemen will be given the opportunity of taking their positions. If they are not filled by the required time conductors and brakemen will be given a chance to take them. A strip of roadbed has been fitted up at Rye, N. Y., for the instruction of the men in the new line of work.

After Sept. 1 the work of continuing the electrical system to Bridgeport will be taken up and it is expected that some time in the winter after Jan. 1 the electrical cars will be run to Bridgeport.

President James J. Hill, of the Great Northern Railway, announces that the Portland & Seattle Railway, a branch line which is now being built between Portland and Seattle, will be equipped with electricity.

EXHIBITS AT COLUMBUS

Work on locating the exhibitors at the Columbus convention is proceeding rapidly and enough exhibitors have already applied for and have been assigned space to insure a larger exhibit than ever before. A general plan of the State Fair Buildings at Columbus was presented in the STREET RAILWAY JOURNAL for May 26, and a detailed plan is published herewith. As will be remembered, there are six brick buildings, forming the group which will be used for the convention. One of these will be devoted to the meetings, one has been reserved for possible future use, and four have been assigned for exhibits. The following is a list to date of those who have applied for space at Columbus:

Allis-Chalmers Company, Milwaukee, Wis.
American Brake-Shoe & Foundry Company, Mahwah, N. J.
American Instrument Company, Philadelphia, Pa.
American Railway Supply Company, New York.
A. & J. M. Anderson Manufacturing Company, Boston, Mass.
Armstrong Oiler Company, Philadelphia, Pa.
Atlas Railway Supply Company, Chicago, Ill.
American Mason Safety Tread Company, Boston, Mass.
American Steel & Wire Company, Chicago, Ill.
Atha Steel Castings Company, Newark, N. J.
Adams & Westlake Company, Chicago, Ill.
Acme Automatic Street Indicator Company.

Bayonet Trolley Harp Company, Springfield, Ohio.
Blake Signal & Manufacturing Company, Boston, Mass.
J. G. Brill Company, Philadelphia, Pa.
Harold P. Brown, New York City.
Buckeye Engine Company, Salem, Ohio.
Burnham, Williams & Company, Philadelphia, Pa.
Brady Brass Company, New York.
S. F. Bowser & Company, South Bend, Ind.
L. M. Booth Company.

Cleveland Frog & Crossing Company, Cleveland, Ohio.
Consolidated Car Fender Company, Providence, R. I.
Consolidated Car Heating Company, New York.
Cook's Railway Appliance Company, Kalamazoo, Mich.
Curtain Supply Company, Chicago, Ill.
Creaghead Engineering Company, Cincinnati, Ohio.
Cambria Steel Company, Philadelphia, Pa.
Carnegie Steel Company, Pittsburg, Pa.

Dearborn Drug & Chemical Works, Chicago, Ill.
D. & W. Fuse Company, Providence, R. I.
Duff Manufacturing Company, Pittsburg, Pa.
Dayton Manufacturing Company, Dayton, Ohio.
Jos. Dixon Crucible Company, Jersey City, N. J.
Duplicate Transfer & Rebate Company, Philadelphia, Pa.
Duquesne Steel Foundry Company, Pittsburg, Pa.
Dossert & Company, New York.
Dressel Railway Lamp Works, New York.

O. M. Edwards Company, Syracuse, N. Y.
Electric Railway Equipment Company, Cincinnati, Ohio.
Electric Storage Battery Company, Philadelphia, Pa.
Chas. I. Earll, New York.
Electric Service Supplies Company, Chicago, Ill.
Eclipse Railway Supply Company, Cleveland, Ohio.

Franklin Car Heating Company, Syracuse, N. Y.
Franklin Electric Manufacturing Company, Hartford, Conn.
Felt & Tarrant Manufacturing Company, Chicago, Ill.

Galena Signal Oil Company, Franklin, Pa.
W. R. Garton Company, Chicago, Ill.
General Electric Company, Schenectady, N. Y.
Gold Car Heating & Lighting Company, New York.
Goldschmidt Thermit Company, New York City.
Globe Ticket Company, Philadelphia, Pa.
Griffin Wheel Company, Chicago, Ill.
General Systems Company, Dayton, Ohio.

Hale & Kilburn Manufacturing Company, Philadelphia, Pa.
F. P. Harrison Electric & Manufacturing Company, Inc., New York.
Albert B. Herrick, Ridgewood, N. J.
Heywood Bros. & Wakefield Company, Wakefield, Mass.
George S. Hastings & Company, Cleveland, Ohio.
Helios Manufacturing Company, New York.

Indianapolis Switch & Frog Company, Indianapolis, Ind.
Ingersoll Company, Pittsburg, Pa.
International Register Company, Chicago, Ill.
International Sprinkler Company, Philadelphia, Pa.

H. W. Johns-Manville Company, New York City.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Kinnear Manufacturing Company, Columbus, Ohio.
Keystone Brake-Shoe Company, New York.

Lagonda Manufacturing Company, Springfield, Ohio.
Lorain Steel Company, Philadelphia, Pa.
Lord Electric Company, Boston, Mass.
George W. Lord Company, Philadelphia, Pa.
Lumen Bearing Company, Buffalo, N. Y.

Massachusetts Chemical Company, Walpole, Mass.
John W. Masury & Son, Brooklyn, N. Y.
Maryland Steel Company, Sparrow's Point, Md.
Miller Anchor Company, Norwalk, Ohio.
McGuire-Cummings Manufacturing Company, Chicago, Ill.
McGraw Publishing Company, New York City.

National Brake Company, Buffalo, N. Y.
National Brake & Electric Company, Milwaukee, Wis.
National Lock Washer Company, Newark, N. J.
Niles Car & Manufacturing Company, Niles, Ohio.
R. D. Nuttall Company, Pittsburg, Pa.
National Car Wheel Company, Pittsburg, Pa.

Ohio Brass Company, Mansfield, Ohio.
Ohmer Fare Register Company, Dayton, Ohio.

Pantasote Company, New York City.
Pressed Steel Car Company, Pittsburg, Pa.
Pennsylvania Steel Company, Philadelphia, Pa.
Pittsburg Insulating Company, Pittsburg, Pa.

Quincy, Manchester, Sargent Company, Chicago, Ill.

Rail Joint Company, New York City.
Recording Fare Register Company, New Haven, Conn.
Jos. T. Ryerson & Son, Chicago, Ill.
Frank Ridlon Company, Boston, Mass.

Sherwin-Williams Company, Cleveland, Ohio.
Southern Exchange Company, New York City.
Speer Carbon Company, St. Marys, Pa.
Standard Paint Company, New York City.
Standard Steel Works, Philadelphia, Pa.
Peter Smith Heater Company, Detroit, Mich.
Security Register & Manufacturing Company, New York.
Standard Varnish Works, New York.
Star Brass Works, Kalamazoo, Mich.
St. Louis Car Company, St. Louis, Mo.
Sterling Varnish Company, Pittsburg, Pa.
The T. H. Symington Company, Baltimore, Md.
Schoen Steel Wheel Company, Philadelphia, Pa.
St. Louis Car Wheel Company, St. Louis, Mo.
Sterling-Meaker Company, Newark, N. J.
STREET RAILWAY JOURNAL, New York City.

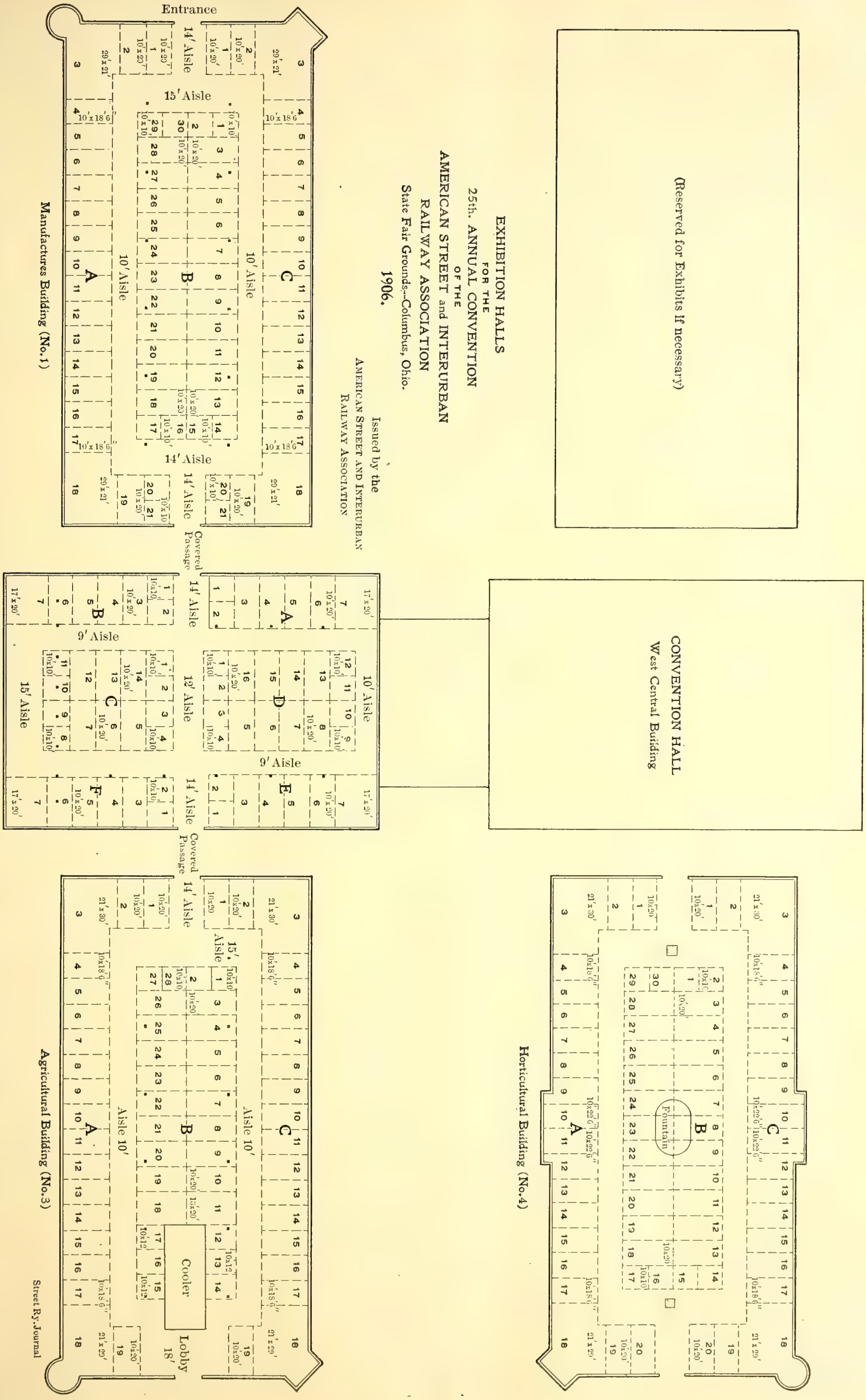
Taylor Electric Truck Company, Troy, N. Y.
Trolley Supply Company, Canton, Ohio.

United States Metal & Manufacturing Company, New York.
United States Engineering Company.

W. T. Van Dorn Company, Chicago, Ill.
Van Dorn & Dutton Company, Cleveland, Ohio.

Wallace Supply Company, Chicago, Ill.
Western Electric Company, Chicago, Ill.
Westinghouse Companies, Pittsburg, Pa.
William Wharton, Jr., & Company, Philadelphia, Pa.
Wheel Truing Brake-Shoe Company, Detroit, Mich.
Wilson Company, Chicago, Ill.

Yale & Towne Manufacturing Company, New York.


EXHIBITION HALLS
FOR THE
25th. ANNUAL CONVENTION
OF THE
AMERICAN STREET and INTERURBAN
RAILWAY ASSOCIATION
State Fair Grounds--Columbus, Ohio.
1906.
Issued by the
AMERICAN STREET AND INTERURBAN
RAILWAY ASSOCIATION
(Reserved for Exhibits if necessary)
Entrance
Manufactures Building (No.1)
Covered Passage
East Central Building (No.2)
CONVENTION HALL
West Central Building
Covered Passage
Agricultural Building (No.3)
Cooler
Lobby 18'
Horticultural Building (No.4)
Fountain
Street Ry. Journal

CORRESPONDENCE

CORRUGATED RAILS

New York, Aug. 6, 1906.

EDITORS STREET RAILWAY JOURNAL:

As an additional contribution to the subject of corrugated rails that was discussed in your editorial of July 21, it may be well to call attention to one class of corrugations, the cause of which can be very directly traced.

Within the past week I have had occasion to examine a piece of steam railroad track on which spots resembling the corrugations mentioned are of frequent occurrence. They are not, however, situated very close together, nor at regular intervals, though there are places where this does occur. Frequently they are from 1 ft. to 18 ins. apart, with some isolated spots remote from any others. In the case in hand these spots are undoubtedly caused by the slipping of the heavy driving wheels of the engines that are used. The markings are unmistakable. There are scoriations as distinct as a glacier mark, with a rolling up of the metal in the direction of the slip, so that the veriest tyro in railroad work would recognize the cause on sight.

It is quite true that these spots are not exactly like those of the corrugations of the rails of electric tracks, nor like those described by the Indian engineer mentioned in your editorial, but it is possible that the clue thus furnished may assist in the final solution of the problem.

The suggestion that these corrugations may be due to vibration and over pressure on the rail is worthy of every consideration, but is it not also quite possible that slip may also have something to do with it?

We have heard for years of the imperceptible slip of driving wheels of locomotives without ever having any definite information on the subject. We do know, however, that where engines are over-cylindered there is a very decided slip and a good deal of it. Again the torque and power of the motors commonly used in electrical equipment is such that slipping is exceedingly common. Is it not possible that it may be a combination of the imperceptible slip that has become quite perceptible with the vibration pressure to which you called attention that have produced these troublesome corrugations?

As you state in your editorial, the matter is well worth the careful investigation of those who are financially interested, and it certainly does not seem that if the work is taken up systematically and with the idea of probing to the bottom of the real cause that the matter will not turn out to be "one of those things no fellow can find out." P. Q. J.

HIGH-VOLTAGE DIRECT-CURRENT LINES IN EUROPE

Oerlikon, July 5, 1906.

EDITORS STREET RAILWAY JOURNAL:

We have read the article in the STREET RAILWAY JOURNAL for June 16, about high-voltage direct-current lines on the Continent. It may perhaps interest your readers to learn that we are at this present moment building, together with Messrs. John Jacob Rieter & Co., Ltd., an electric railway for direct-current railway with a line potential of 1500 volts. The maximum grade of this railway is 6 per cent.

We may add that we have built and equipped since 1902 a number of direct-current electric railways with 800 volts potential or over. The principal lines of this kind are the following:

Bremgarten-Dietikon, 800 volts; Chemin de fer Veveysans, 800 volts; Fribourg-Morat-Anet, 800 volts; St. Gallen-Speicher-Trogen, 800 and 550 volts; Wetzikon-Meilon, 800 volts; Montreux-Oberland-Bernois, 700 and 1100 volts; Sernftal, 800 volts; Schaffhausen-Schleitheim, 800 and 550 volts.

MASCHINENFABRIK OERLIKON.

A NEW BRAKE SHOE COMPANY

A new corporation, to be known as the Keystone Brake Shoe Company, has been organized under the laws of the State of New York. The incorporators are Charles H. Platt, Charles A. Decker and A. N. Allen. Mr. Platt was formerly general manager of the New York, New Haven & Hartford Railroad. The company has secured the patents of a new type of brake shoe which has been undergoing severe tests for some months past. It is claimed the factor of safety in the Keystone shoe is much greater than shown by the types of shoe now in general use. The new shoe is designed to wear out without scrap, to be applicable to any wheel from 30 ins. or 36 ins. in diameter, and to form a standard shoe for traction equipment, regardless of the different heads or trucks. Another advantage claimed for the new shoe is the saving in cost of labor in applying the shoe to a head as compared with other types of brake shoes.

The Keystone Brake Shoe Company is planning to make an exhibit at the Columbus convention in October, and the company expects by that time to have manufacturing arrangements completed which will make possible the prompt filling of orders.

STREET OILING IN CALIFORNIA BY THE HUNTINGTON ELECTRIC RAILWAY COMPANIES

The Huntington street car companies will assist the members of the Board of Public Works in its plans for oiling between 50 and 60 miles of the city's streets within the next twelve months. W. E. Dunn, attorney for the Huntington lines, has notified the board that when the city oils a thoroughfare traversed by any of the Huntington tracks the company will oil between and along the sides of its rails. This plan, if carried out, would greatly benefit both the city and the railway company, as it is estimated that the saving to the city will be between 30 and 40 per cent, and if the entire street is oiled the space between the tracks and along the sides lasts much longer. When the streets are oiled, which will be as soon as the Board of Public Works can secure the necessary appropriation, those streets along which car tracks are laid will be the first to be improved, as the dust nuisance is greatest on those streets.

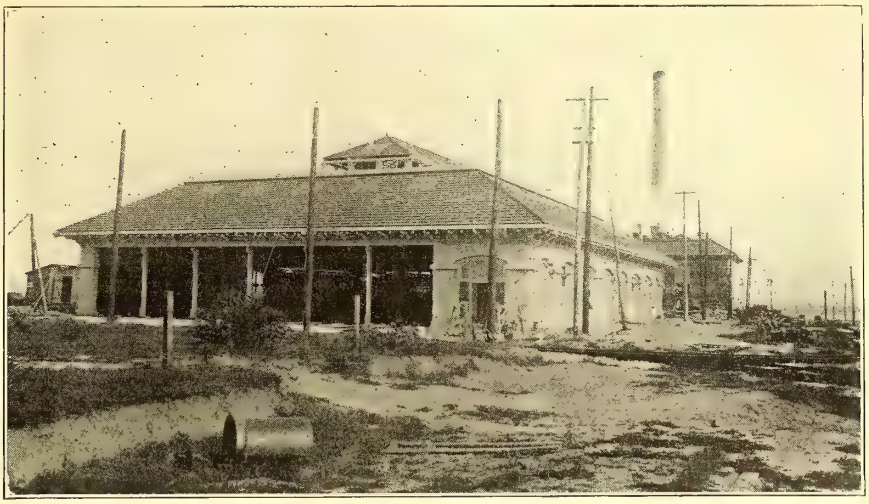
SIX TICKETS FOR A QUARTER IN PHILADELPHIA

The sale of "six tickets for a quarter" was begun at midnight, July 31, by the Philadelphia Rapid Transit Company. The demand was large. The tickets in strips of six are printed upon a stiff light buff-colored paper, and have very little printing upon them. Each conductor as he reports for duty is supplied with $20 of new tickets. Hundreds of patrons called at the office of the Rapid Transit Company in the Land Title Building and at Eighth and Dauphin Streets endeavoring to buy some of the tickets in advance. All such requests were refused. Exchanges will be sold as heretofore. Tickets will be honored for fares on all lines and free transfers will be given. The ticket and 3 cents will not purchase an exchange, the latter being sold to cash fare patrons only.

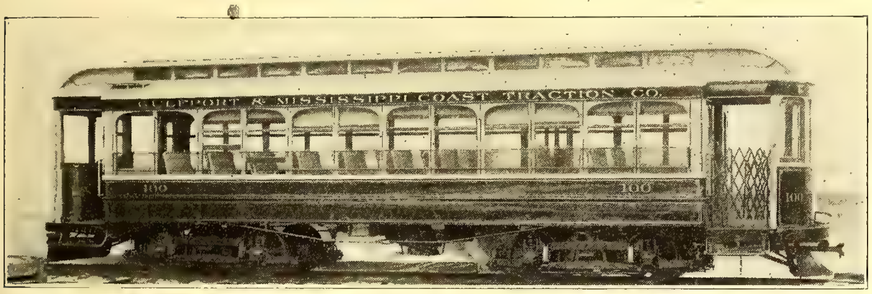
EQUIPMENT FOR NEW LINE BETWEEN GULFPORT AND BILOXI, MISS.

The J. G. Brill Company shipped a few weeks ago to the Gulfport & Mississippi Coast Traction Company ten combination passenger and smoking car bodies, mounted on the builders' 27-E1½ type of truck. The exterior of the car is given an imposing appearance by using the arched-top twin-window arrangement. This does not interfere with the grooveless-post semi-convertible feature; the details of the Brill system are carried out in exactly the same manner as in the ordinary type of window. It will be noticed that the curvature of the arch is designed in such a manner as to give a large window opening and not have an objectionable appearance as viewed from the interior. A more pronounced arch could be used with this company's semi-convertible window system if desired, but the design shown in the Gulfport cars is considered to be the most effective, and at the same time does not materially reduce the window space.

Throughout the entire car elegance has been combined with comfort, the interior being fitted with such accessories as basket racks, arm rests, push buttons, etc., and the high roll-back seats, 38 ins. in length, of the car builder's manufacture afford additional comfort to passengers. The compartment for smokers occupies the space of one and a half double windows, or three single windows, and is separated from the passenger compartment by a swing door. The inside finish is of natural cherry and the ceilings are of a decorated birch. The cars will haul trailers and the car company's radial draw bar is employed for this purpose. Other specialties of the builder are angle-iron bumpers, signal bells and alarm gongs, steps, folding gates, etc.

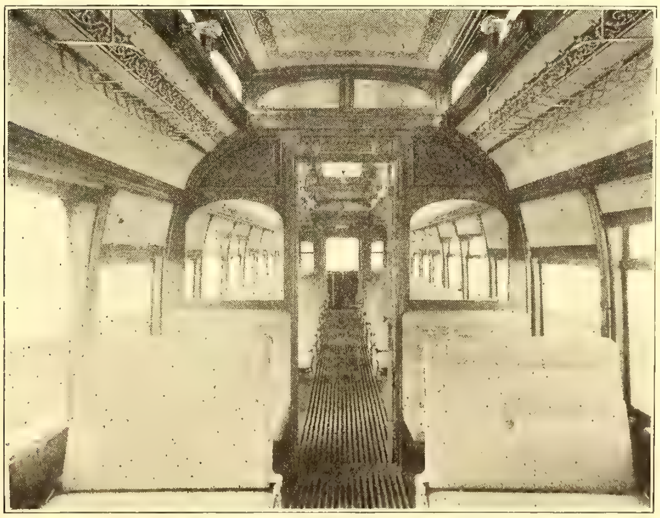


VIEW OF THE GULFPORT & MISSISSIPPI COAST TRACTION COMPANY'S CAR HOUSE, POWER HOUSE IN THE REAR



STANDARD CAR FOR THE GULFPORT & MISSISSIPPI COAST TRACTION COMPANY

A VIEW ALONG THE LINE PARALLELING THE SHELL BEACH ROAD BETWEEN GULFPORT AND BILOXI



INTERIOR OF STANDARD CAR, SHOWING COMPARTMENTS AND SEATING

The trucks have a wheel base of 6 feet and four motors of 50-hp capacity each are installed on each bar. The chief dimensions of the car are as follows: Length over the end panels, 33 ft. 4 ins.; length over the crown pieces and the vestibules, 42 ft. 9 ins.; width over the sills, including the panels, 8 ft. 2½ ins.; width over the posts at the belt, 8 ft. 6 ins.; sweep of the posts, 1¾ ins.; centers of the posts, 2 ft. 8 ins.; size of the side sills, 4 ft. x 7¾ ins.; size of the end sills, 5¼ ins. x 6⅞ ins.; size of the sill plates, 12 ins. x ⅜ in.; width of the aisle, 22 ins.

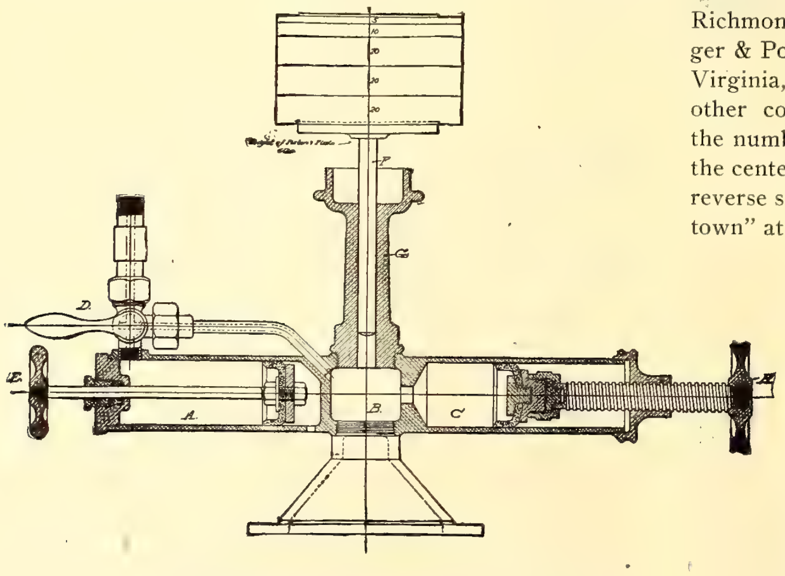
The Gulfport & Mississippi Traction Company operates about 3 miles of tracks in Gulfport and about 7 miles in Biloxi, and between these two coast towns a new line has just been opened, and from the fact that Biloxi is a flourishing resort and Gulfport is a big shipping and railroad center and has a fine harbor where ocean steamers may find roadway, heavy traffic is expected. Midway between Gulfport and Biloxi, and reached by the company's new line, is

Mississippi City, located in a great fruit-producing region. The traction company will also build in the near future a line from Gulfport to Pass Christian, the latter being the most popular and fashionable of all the gulf resorts, being known as the "Newport of the South." When this line is completed the traction company's system will embrace about 35 miles. One of the accompanying views shows a car being operated over the famous shell beach road between Gulfport and Biloxi. The new power house and car houses which have just been completed, are also shown in the illustration. The power house has a capacity of 1500 kw.

A DEAD-WEIGHT GAGE TESTER

The American Steam Gauge and Valve Manufacturing Company, of Boston, Mass., has added to its numerous steam specialties a new dead-weight gage tester which it considers a radical improvement over similar devices in use. All tests are made with dead weights in 5-lb. units, and the apparatus can be furnished for any desired pressure up to 1500 lbs. It is claimed that this tester possesses all the advantages of the mercury column enclosed in a much smaller space, besides doing away with the necessity of returning test gages to the manufacturer for periodical readjustment to be assured of their accuracy.

Its novel features consist of an auxiliary cylinder *A* connected with the gage and main pump cylinders *B* and *C* through the three-way cock *D*, the connection being made by turning the lever cock connected with either gage to the main pump cylinders as is desired, eliminating the necessity of pouring the oil in and out of the pump cylinders before and after testing. The auxiliary oil chamber *A* and the main pump cylinders *B* and *C* are filled with a light mineral oil, cylinder *A* being filled through the pump cylinder *G* by



SECTIONAL DRAWING OF GAGE TESTER

removing the plunger *F* and turning the three-way cock to connect the cylinders *A* and *B* through the connecting tube. Before the oil is poured in, the plunger *E* is withdrawn, and as the oil is poured in the plunger *E* is pushed in, drawing oil over through the tube and cock and thus filling cylinder *A*. The main pump cylinders *B* and *C* are filled through the pump cylinder *G* by screwing out on screw plunger *H* as the oil is poured in; in testing, it is not necessary to continually screw in on the plunger *H*. This is said to be necessary in some other makes of dead-weight testers.

After the table and piston *F* have been lowered by the first application of weights and have been raised with the screw plunger, it is only necessary to raise the table and plunger twice while testing to 500 lbs. Another feature is the fact that after completing the test of the gage, the cock may be turned connecting the gage with the cylinder *A*, and by pushing in on plunger *F* the connections and gage tube can be drained of the oil, thus preventing spilling when the gage is disconnected.

The gage to be tested is attached to the nipple connected by the union above three-way cock *D*. The gage and fittings are then filled by withdrawing piston *E*; the three-way cock then turns in the position which places the gage in communication with chamber *A*. When the movement of the index hand indicates what pressure is on the gage, the three-way cock is turned so as to put the gage in communication with chamber *B*. The weights are then applied to the desired pressure, being revolved from time to time to obviate friction. The table and piston *F* operate the pressure about 5 lbs. per sq. in., and the 5, 10 and 20-lb. weights sent with tester are used to obtain the desired pressure for test. After the weights are first applied, the table should be raised to a position of 2½ ins. above cylinder *G* to prevent the table from striking. The table is raised by screwing in the plunger *H*. The pump is neatly boxed and furnished with the following fittings: Necessary wrenches, hand set, hand jack, four connection nippers and plyers. The accompanying weights are furnished in a separate box.

SPECIAL RAILWAY TICKETS FOR THE JAMESTOWN EXPOSITION IN 1907

The Virginia Passenger & Power Company has ordered several million special street car tickets for use during the Jamestown Exposition. The tickets are printed on white cardboard. On the face is printed in black ink: "One Fare. Richmond Passenger & Power Company. Virginia Passenger & Power Company," so arranged as to have "Richmond, Virginia," appear in one line. Underneath the names of the other companies appears "Richmond Traction Company," the number of the ticket and the names of the receivers. In the center of the ticket appears the head of Pocahontas. The reverse side carries the tower of Jamestown and "1607 Jamestown" at the top and "Exposition, 1907," at the bottom.

EXCURSION RATE WAR IN OHIO BETWEEN STEAM AND ELECTRIC LINES

The Lima & Toledo and the Western Ohio lines have precipitated an excursion rate war between Dayton and Lima and Chicago and Cleveland. The Pennsylvania, Erie and Nickel Plate roads have been in an agreement not to make cheap excursions to Chicago and Cleveland. Without making an actual alliance with the Nickel Plate railroad, the electric cars arranged with the steam line to honor its prepaid ticket orders at Ft. Wayne and Findlay for Chicago and Cleveland respectively. While not the same as an interline ticketing arrangement, this scheme answered the same purpose, and the Erie and the Pennsylvania are now retaliating by reducing their rates between the points mentioned.

According to officials of the operating companies, the earnings of the State Street line and the Blue Island line, the first two cable lines in Chicago to be trolleyized, have increased greatly since the change in motive power.

FINANCIAL INTELLIGENCE

WALL STREET, Aug. 8, 1906.

The Money Market

There has been no appreciable change in the monetary situation during the past week. Notwithstanding the increased activity in the securities markets, the demand for money from stock commission houses has been comparatively small, while the offerings of money for all maturities up to nine months have been rather free. Money on call ranged from 3 to 2 per cent, the average rate for the week being about 2¾ per cent. In the time loan department sixty and ninety-day money was freely offered at 4 and 4½ per cent, respectively, while for five and six months' accommodations were obtainable at 5½ per cent. For the maturities extending into next February and March, funds were offered at 5½ per cent, but borrowers were not disposed to commit themselves for so long a period. It is not expected that money rates will advance materially in the near future. It is true that the clearing house banks are losing money to the Sub-Treasury, but this is due to the fact that pension payments are at the lowest ratio of the month, while customs collections are fairly large. The receipts of currency from the interior show a falling off as compared with the preceding week, due in part to the fact that banks at the principal inland cities are already making provision for crop-moving purposes, which is somewhat earlier than usual. This, it is expected, will result in the movement from this center beginning earlier than in previous years, but as the position of the New York City banks is strong, little apprehension is felt on this score. The payment for the Panama Canal bonds has been in progress throughout the week, the total amount paid to date being nearly $8,000,000. As the bulk of this money is almost immediately redeposited in the banks the transaction has been made without the slightest disturbance in the market. It is not expected that any stringency will develop as a result of the shipments of funds from New York to the interior for crop-moving purposes, although all the crops promise to be large and will call for a considerable amount of money. As a matter of fact, it is said that the Secretary of the Treasury has given this matter some consideration, and a repetition of last year's tension in the money market will doubtless be averted. It is pointed out that the Secretary of the Treasury has about $50,000,000 free capital at his disposal, and may be used for the purchase of Government bonds, or by the deposit of Government funds with the national banks. A feature of the week has been a sharp upward movement in the rate for sterling exchange, prime demand bills advancing about ½ cent to 4.85.35, thus eliminating all possibilities of gold importations from Europe. The advance in exchange was due largely to the Russian disturbances, which resulted in rather heavy selling of American securities by Paris and London. The bank statement published last week was rather favorable, the decrease in cash was only $649,200, or considerably below the preliminary estimate. The reserve required was $4,120,600 larger than in the preceding week, and resulted in a decrease in the surplus reserve of $4,769,800. The total surplus on Aug. 4 was $14,122,675, as against $12,163,525 in the corresponding week of 1905, $56,308,850 in 1904, $21,587,075 in 1903, $9,031,250 in 1902, $20,952,950 in 1901, and $29,144,875 in 1900.

The Stock Market

The stock market during the week developed pronounced strength, and prices are higher all along the line. This is the result of a general short covering movement. The most important development from the bull standpoint has been the action of the directors of the United States Steel Corporation, in restoring the common stock to the dividend ranks by the declaration of two quarterly dividends of one-half of 1 per cent each, covering the first two quarters of the year. This was accompanied by a statement for the second quarter showing that net earnings were of record volume, and that after making all deductions the balance available for dividends was $27,036,025, and after providing for the preferred there remained $20,731,106 for the common. Special deductions were $15,500,000, leaving $5,231,106, or more than sufficient for the 1 per cent on the common, while for the six months the surplus amounted to $5,715,081. The unfilled orders on hand amounted to 6,809,589 tons, and the position of the corporation was shown to be very strong. This applies equally well to all the iron and steel companies, and reflects a remarkably satisfactory condition of trade in all lines. There has been a revival of deal and merger rumors, which include the proposed lease of the Great Northern ore lands to the Steel Corporation, control of the St. Paul by either the Union Pacific or the Northern Pacific, a further rearrangement of the railway map in the Northwest, and by rumors of increased dividends by several companies, including the Union Pacific and the Atchison and by expectation of an early initial dividend on Southern Pacific. In fact all the news favored market improvement and caused a retreat on the part of the short interests. Crop conditions have been encouraging, and the Government report on grain to come out on Friday is expected to make a good showing. The Russian situation is less alarming, even if not really better, and the monetary outlook has been improved by the assurance that Secretary Shaw will render all necessary relief to prevent any stringency during the crop-moving period. This is of the greatest importance if the present upward movement in prices is to continue. It appears that the big interests are disposed to move the market to a higher level before any political agitation of tariff or other reforms, and the advance is now fairly under way. Barring some unexpected accident there does not appear to be any serious obstacle to such a movement.

The local traction stocks have been strong, with a sharp advance in Brooklyn Rapid Transit on a forced covering of shorts, put out on expectation of a decision against the company in the 5-cent fare controversy.

Philadelphia

Dealings in the local traction issues have been upon an extremely small scale during the past week, but prices generally reflected the strength prevailing in the general market. The trading was heaviest in Philadelphia Rapid Transit, of which about 1,200 shares changed hands from 31 to 30¼. Philadelphia Company common was extremely quiet at the opening, with sales at 49, but towards the close the price advanced to and closed at 51⅝, on transactions aggregating about 700 shares. The preferred stock was extremely quiet, with sales at 50½ to 51¼. Union Traction advanced ½ to 64, on purchases of odd lots, and Philadelphia Traction rose a fraction to 98¾. Other transactions included American Railways at from 52 to 52½ and back to 52⅛, United Companies of New Jersey at 255, and Railways General at 6⅝.

Baltimore

Trading in the Baltimore traction issues was extremely quiet. There was no disposition to trade actively, but at the same time there was no marked pressure to sell. The feature was United Railway issues. The income bonds, after opening at 71¾, ran off to 71 on sales of less than $100,000. The 4 per cent bonds ruled firm, with sales at 91¾ and 92. The certificates representing income bonds deposited sold at 70½ for a small amount, and the new funding 5s sold to the extent of $11,000 at 90½ to 90. Lexington Street Railway bonds were steady at 101⅝.

Other Traction Securities

In the Boston market trading was dull, but prices generally held firm. Boston Elevated, after selling at 153, declined to 150, ex the dividend. Boston & Worcester common sold at 30 for 100 shares, while odd lots of the preferred brought prices ranging from 79 to 79¾. Boston & Worcester rights sold at 4c., Massachusetts Electric common sold at 20¼, and the preferred changed hands at 68¾ and 69. West End common advanced from 94 to 95, while the preferred rose from 109½ to 110. West End 4s of 1915 sold at 100¾. The Chicago market has been quiet but firm. North Chicago, after a decline from 41 to 39, recovered to 40. Union Traction, after selling at 5⅛, ran off to 4¾, and recovered a small fraction. The elevated railroad issues were strong, Metropolitan Elevated sold at 30, and South Side Elevated at 97½. Chicago & Oak Park brought 5⅞ for small amounts. In the bond department, Northwestern Elevated 4s sold at 91, Metropolitan gold 4s at 92¼, and South Side 5s at 96.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Aug. 1	Aug. 8
American Railways	52	52⅛
Boston Elevated	a153	*147
Brooklyn Rapid Transit	80¼	80⅛
Chicago City	170	160
Chicago Union Traction (common)	4	4¾
Chicago Union Traction (preferred)	13¾	15
Cleveland Electric	81	81
Consolidated Traction of New Jersey	78	78
Detroit United	94½	94¾
Interborough-Metropolitan, W. I	38½	36½
Interborough-Metropolitan (preferred), W. I	78¼	77⅛
International Traction (common)	—	a55
International Traction (preferred), 4s	—	78
Manhattan Railway	148½	147
Massachusetts Electric Cos. (common)	20	19¾
Massachusetts Elec. Cos. (preferred)	68½	69½
Metropolitan Elevated, Chicago (common)	27	28
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	—	—
North American	96⅞	95½
North Jersey Street Railway	27	27
Philadelphia Company (common)	49½	50¾
Philadelphia Rapid Transit	30⅜	30⅜
Philadelphia Traction	98½	98¾
Public Service Corporation certificates	68	68
Public Service Corporation 5 per cent notes	95½	95½
South Side Elevated (Chicago)	95	96
Third Avenue	124	124
Twin City, Minneapolis (common)	113¼	113
Union Traction (Philadelphia)	63⅜	63⅝
West End (common)	—	—
West End (preferred)	—	—

a Asked.

Metals

Unprecedented activity is reported in all branches of the iron and steel trade. It is estimated that the finished iron and steel tonnage placed in July was the largest in the history of the trade. Pig iron continues scarce, and no trouble is experienced in obtaining prices if deliveries can be satisfactorily arranged. Birmingham producers report free sales at $14. Bessemer is firm at $18 valley furnaces. Tin plate is active, although this is usually a dull season, and indications point to some large orders being placed this month. Copper metal is firm and unchanged at 18⅝ and 18¾c. for lake, 18⅜c. asked for electrolytic, and 18 and 18¼c. for castings.

MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION TO CONSIDER PUBLICATION OF TARIFF SHEETS

At the call of Secretary Merrill, of the Central Electric Railway Association, a meeting was held last week at the Algonquin Hotel, Dayton, to pass upon the plans for publishing the first of a number of interline tariff sheets for the roads in the district covered by the association. The first sheet covers the routes out of Indianapolis, including all the Indiana roads and over Ohio lines connecting Toledo, Marion, Zanesville, Lancaster and Cincinnati and all local stations between. Representatives of ten properties were present. It was decided that the general form of tariff should include the destination, routeing one way and round-trip rate and rules and regulations for the transportation and transferring of baggage. In cases where there are several routes between two points, the short line rates will be indicated and will prevail on over-all routes without reference to mileage, this action being in accordance with the rule that the initial line shall indicate the route to be used. As the association has been unable thus far to come to an agreement on the matter of charging for baggage, this question will be taken up at another meeting to be held in the near future with a view to securing some concession on interline baggage. The announcement was made that arrangements had been made for transferring baggage in Dayton and Springfield, where there are no union stations, the cost of transfer to be borne by the two companies concerned. It was proposed that separate meetings of the traffic men be held preceding each of the meetings of the Central Electric Railway Association, such meetings to be open only to the officials in charge of traffic, the idea being to promote rules and regulations for the handling and development of long-distance business over interurban lines. President Spring was authorized to take up this matter with the executive committee and to arrange for such a meeting to be held a day or so prior to the next meeting of the association, Sept. 26, at Fort Wayne, Ind.

DETROIT UNITED RAILWAY FRANCHISE OFFER

An agreement has been reached between Mayor Codd, of Detroit, and President Hutchins, of the Detroit Railway, as to the terms of the new street railway franchise for the company. All of the franchises are to expire in 1924, when the city will have the right to buy the property. The company will make a number of concessions, including an offer of ten tickets for 25 cents during workingmen's hours, six tickets for 25 cents at all other times and general transfers. It will also pay a 2 per cent tax on its gross earnings. A majority of the Aldermen are in favor of granting such a franchise, and it will probably be carried.

CORONER'S REPORT OF STREET RAILWAY ACCIDENTS IN CHICAGO—CHICAGO CITY RAILWAY COMPANY BORROWS $3,000,000 TO IMPROVE SERVICE

According to a report gotten out by the Coroner of Cook County there have been 225 deaths due to street railway accidents in Chicago in the last nineteen months. The accidents are classified as follows:

Class 1, crossing car tracks	121
Class 2, knocked off wagons	20
Class 3, crushed between cars	16
Class 4, falling off cars	31
Class 5, getting on and off cars	17
Class 6, hitching on cars	3
Class 7, brushed off running board	7
Class 8, collision between cars	6

High speed through congested districts, running cars in trains instead of singly, defective equipment and track, and overcrowding of cars, according to the report, are some of the causes of the accidents. The Coroner suggests as a remedy that better car equipment be obtained, lower speeds be inaugurated through congested districts, and that every passenger be given space inside the car. Deaths due to getting on and off cars, he says, could be prevented by the use of an automatic gate such as is supplied in Minneapolis and St. Paul. The Coroner asks that each police wagon sent to a street railway accident be accompanied by a special officer, whose sole duty shall be to make an immediate personal investigation, and to transmit full information, with names of persons and other data, to the Coroner's office, so that the Coroner and his deupties could issue the summons and make fuller investigations than now.

He also suggests that two expert machinists, attached either to the Coroner's office or the police department, make investigations of the mechanical condition of cars immediately after the accident.

The Chicago City Railway Company has obtained a loan of $3,000,000 from a syndicate composed of Chicago banks. The money will be spent in trolleyizing and improving the lines, and will be expended in the following manner:

New cars	$650,000
Trolleyizing, placing of feed wires, etc	600,000
Purchasing power during negotiations with city	750,000
Building sub-stations for power and re-equipping old cars	800,000
Incidentals, including installation of transformers, etc.	200,000
Making up the total of	$3,000,000

E. K. Boisot, vice-president of the First Trust & Saving Bank, who negotiated the loan, said:

"The banks represented in the loan have ample security in the tangible property of the company, which is estimated to be worth $20,000,000. But there is another element in the loan; the banks believe the good sense of the people of Chicago is an element, and notwithstanding the agitation of the question of municipal ownership, there is every indication that it is good service that the people demand, and not city ownership."

ENTERTAINMENT TO STAFF BY PRESIDENT OF THE NEW YORK CITY RAILWAY COMPANY

On Aug. 1, President Vreeland, of the New York City Railway Company, entertained the staff and heads of departments of the New York City Railway Company at his home in Brewster, N. Y., where they enjoyed a genuine Rhode Island clam-bake. These outings have been given annually for the past eight years, or since Mr. Vreeland has lived in Brewster, and are one of the most delightful events of the year to those fortunate enough to secure an invitation. Although the sky was overcast the day proved an ideal one for the trip. A party of about 125 rode in three special cars attached to the Harlem Railroad express, to Brewster, and enjoyed an elaborate clam and fish dinner at the Tonetta Outing Club. Later the guests were driven to Mr. Vreeland's country residence, "Rest-a-While," where they received a cordial reception from Mrs. Vreeland and a number of Brewster ladies. The party returned to New York by special train about 9 o'clock in the evening. These outings are characteristic of the cordial relations existing to all of the rank and file of the New York City Railway Company, and are one evidence only of the regard of the president for all those with whom he is associated in business.

In addition to the members of the New York City Railway Company there were a few other invited guests at the clam-bake, including: Edward A. Maher, president, Union Railway; G. Tracy Rogers, president, Binghamton Railway Company; E. P. Bryan, vice-president, and Frank Hedley, general manager, Interborough Rapid Transit Railway Company; W. G. Besler, vice-president and general manager, and W. McIntosh, superintendent of motive power, Central Railroad of New Jersey; H. S. Hayward, superintendent of motive power, Pennsylvania Railroad; C. H. Ketcham, division superintendent, Delaware, Lackawanna & Western Railroad, and B. B. McCoy and M. Bronson, of the New York Central & Hudson River Railroad.

PENSIONS PROPOSED IN VICTORIA

J. A. Buntzen, managing director of the British Columbia Electric Railway, has submitted to the employees of the company for their ratification a pension scheme, which more than likely will be adopted. The proposition is an annual payment of $3.00 from each man, taken from the dividend payments by the company from its profits, to its employees. To this the company will add dollar for dollar. The pensions are to be paid to employees reaching the age of 60, who have been in the employ of the company fifteen years. The amount of the pension shall consist of one-half or one-quarter of the salary last received as recommended by the committee of the union. All attaining a salary of $100 per month are placed outside of the provisions of the scheme. According to this plan it will be seen that the employees will not be asked to pay anything out of the wages earned by them.

A NEW LINE FOR ST. LOUIS

Articles of incorporation were filed Aug. 3 for a new street railway which will mark the re-entry into the traction business of St. Louis of the former owners of the Union Depot Railway, including John Scullin, Thomas W. Murphy, James Scullin and others. Thomas Scullin was superintendent and general manager of the Union Depot system under the regime of the Scullins, and he very probably will assume a similar position with the new company. Since John Scullin retired from the street railway business at the time Brown Bros., of New York, bought and consolidated the St. Louis lines of the present United Railways Company, there have been various reports at different times that he would build an elevated railway and also surface lines, but nothing definite was done until the actions of Aug. 3. The route of the road will be from Broadway to the city limits on the Hall's Ferry Road, a distance of 1 mile, for which a franchise was granted recently by the Municipal Assembly. The route of the road in the county will probably extend from Hall's Ferry Road at the city limits through Jennings and Ferguson, but a franchise has not yet been secured for the county section of the road. The promoters of the new road are interested in a track of land in North St. Louis, embracing 200 acres or more. As soon as plans are arranged the company will begin the work of laying out a sub-division designed to be one of the best residence sections of the city. Engineers are engaged on plans for the new road. The company is capitalized for $50,000.

ROCHESTER, CORNING & ELMIRA COMPANY ORGANIZED

The certificate of incorporation of the Rochester-Corning-Elmira Traction Company, successor to the Rochester & Southern Railway Company and the Rochester & Elmira Electric Railway Company, has been filed with the Secretary of State at Albany and in the office of the Monroe County Clerk. The company is incorporated for a period of 1000 years for the purpose of building, maintaining and operating a street surface railroad between Rochester, Corning and Elmira, to be operated by electricity or any power other than steam.

The road will be 120 miles in length, and will extend from the intersection of Mount Hope and Elmwood Avenues, at the south line of Rochester, to the intersection of State and East Water Streets, Elmira. The company is capitalized at $4,000,000, divided into 40,000 shares of a par value of $100 each.

The board of directors is constituted for the first year as follows: Max H. Schultze, C. O. Geer, Frederick Eckstein, Henry Brunssen, Harry Velthusen, Horace G. Abel and Tracy S. Buckingham, of 42 Broadway, New York; and Samuel M. Levy and Henry H. Kaufman, of 141 Broadway, New York. Those directors, whose address is given as 42 Broadway, are either members or employees of the firm of Otto Heinze & Company, bankers and brokers, in which the control of the Rochester-Corning-Elmira Traction Company is lodged.

The original company, which was not incorporated, was the Rochester & Southern Railway Company, but the control passed to the Heinzes in February last. The initial hearing before the State Railroad Commission is to be held in Rochester on Sept. 18.

CAMDEN INTERSTATE COMPANY CHANGES HANDS

It is reported that State Senator William C. Sproul, of Chester, Pa., and business associates have obtained control of the Camden Interstate Railway Company, of West Virginia, Kentucky and Ohio, which owns the electric lines and lighting plants in the cities of Huntington and Kenova, W. Va.; Catlettsburg and Ashland, Ky., and Ironton, Ohio, together with the lines connecting those places. It operates about 30 miles of electric railway and runs about sixty cars. Senator Sproul is the president and principal owner of the Kanawha Valley Traction Company, of Charleston, W. Va., to which point the Huntington line is being extended. The Kanawha Valley road is being built to St. Albans. The directors of the Kanawha Company, besides Senator Sproul, are Rudolph Ellis, president of the Fidelity Trust Company, of Philadelphia; George W. Stevens, president of the Chesapeake & Ohio Railway, Richmond, Va.; Morris L. Clothier, of Philadelphia; Robert Wetherill, of Chester; ex-Governor William A. McCorkle and William E. Chilton, of Charleston, W. Va. It is understood that these persons are interested with Mr. Sproul in the purchase of the Camden Insterstate Railway.

ANNUAL REPORT OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

The annual report of the Westinghouse Electric & Manufacturing Company for the year ending March 31, 1906, was presented at the meeting of the stockholders July 25, and shows sales for the year of $24,939,602, as compared with $16,570,717 last year. The sales for the first five months of 1906 have averaged $2,850,000 per month.

The report has considerable to say in regard to the company's railway business. Its sales of railway motors have increased 51 per cent over last year, and those of the electro-pneumatic switch control 60 per cent over any previous year. The single-phase system is referred to at considerable length, and the following list is given of the companies which have adopted single-phase motors: In operation, Vallejo, Benecia & Napa Valley Railway, Warren & Jamestown Street Railway, Westmoreland County Street Railway, Indianapolis & Cincinnati Traction, Glen Cove branch of Long Island Railroad, Atlanta & Northern Railway. Under construction, New York, New Haven & Hartford Railroad, Grand Trunk Railway, Spokane & Inland Railroad, Ft. Wayne & Springfield Railway, Pittsburg & Butler Traction.

In other branches of the work the company reports contracts aggregating $6,000,000 for tramway construction in St. Petersburg, Russia; an increase in turbo-generator sales of 94 per cent, as compared with last year, and an increase in sales of subsidiary companies, like the Nuttall Company.

CLEVELAND TRACTION SITUATION

The traction situation in Cleveland continues to develop interesting phases. Mayor Johnson and Director of Public Service Springborn were tried for contempt of court in neglecting to stop the work of pulling up the tracks of the Cleveland Electric Railway on Fulton Street, which was referred to quite fully in this paper last week. Mayor Johnson was purged of contempt, but Director Springborn was adjudged guilty and fined $100. The court based his decision upon his opinion that Mayor Johnson had made an effort to learn what he was being enjoined from doing, while Springborn, who was in personal control of the railway ripping work, was remiss in not stopping the work when the writ was served. The judge rebuked the city authorities for their claim that the work had been continued merely to put the street in a passable condition, stating that it was clear that the real purpose was to put down the rails of the other company. The city has filed notice of an appeal for a new trial for Director Springborn.

Councilman Hitchins, who introduced the proposed ordinance for the Cleveland Electric Railway Company, has announced that he desires to make some changes in the ordinance before it goes to the vote of the people. He desires to make the proposed grant expire in twenty years instead of twenty-five years, and to insert a municipal ownership clause whereby the city may buy the property at the expiration of the grant. President Horace Andrews, of the company, has invited the Councilman to prepare a new ordinance embodying his views.

The low fare company has been quick to take up this situation, and in its interviews and advertisements intimates that the old company has been deserted by its chief sponsor. The war of words in the newspapers has been going on fast and furious. The old company continues to publish large advertisements in the morning papers bringing out the chief points of its proposition, while the new company answers them in the afternoon papers. A point has been reached where personalities are being indulged in. Mayor Johnson in an interview stated that the best of the old company's grants would expire within three years. The old company called him a prevaricator in as many words, and pointed to the report of Johnson's own man Bemis, who stated that the leading grants have seven years to run.

In an interview, Mr. Andrews said: "If Mr. Johnson continues such attacks upon this company, he will find that the battle will not be over or lost until the public is in possession of information which it is not now possessed of—information which will reveal Mr. Johnson's real relation to the Forest City Company, the so-called Municipal Traction Company, and also his relation toward certain other franchise matters which have been passed under his administration and with his aid. We believe that when all the facts are known, the traction question will be taken into the hands of the public itself for settlement, and will be settled right."

There are some interesting possibilities in this threat, and even Mr. Andrews' enemies agree that an official in his position who has always been noted for his conservative policy, would not make them without ample grounds. Mayor Johnson has all along denied any financial interest in the various low fare companies which he has openly fought for, and proof to the contrary would place him in a bad light.

The injunction restraining the city from further work on Fulton Street is still in force and the case is now being tried. Judging from the evidence presented, it is a safe guess, at this writing, that the court will decide that the city authorities had no right to take the law into their own hands and tear up the tracks of the old company.

Frank DeHass Robison, who formerly had a street railway system in Cleveland, and who announced that he would accept a franchise on a 3-cent fare basis, is said to be securing consents and arranging to apply for franchises over several routes covering about 50 miles of streets in various parts of the city.

UNFORTUNATE ACCIDENT ON LAKE SHORE

Disobedience of orders by a motorman, who paid for his error with his life, was responsible for a bad wreck on the Lake Shore Electric Railway 1 mile west of Vermillion last Sunday. A westbound Cleveland-Toledo limited crashed head on into an eastbound local car, telescoping both cars, killing two passengers and injuring about fifteen others, several of them quite severely. Both cars were late, and usually passed each other at Linwood Park, but in this case the despatcher gave both orders to pass at Siding 38, a mile beyond Linwood. The limited was running in two sections, and Motorman Moody, of the first section, instead of remaining on the siding tried to make the next siding, contrary to his orders. The collision occurred 1000 ft. beyond the siding, and both cars were running at high speed. The motorman of the limited jumped and struck a trolley pole and was killed instantly. The second section of the limited took the siding according to orders, and its crew telephoned to the despatcher that the first section had gone on. The limited was crowded with people, and in direct defiance of orders the motorman allowed a number of people to stand on the front platform. The written order instructing the limited to pass a local at Siding 38 was found in the motorman's cab after the wreck.

NEW YORK SUBWAY FLOODED

Joining forces with a broken water main the thunderstorm which broke over New York shortly after 7 o'clock p. m. Tuesday, Aug. 7, flooded the subway below Fourteenth Street, leaving the tracks a foot under water in places and completely tying up downtown traffic for the rest of the night. Trains were run to Fourteenth Street and shuttled back, but between Fourteenth Street and the Battery none were run. It was almost 7:30 o'clock when the first trains in the subway were held up by the water, and at least an hour later before anything like order was restored above Fourteenth Street. The flooding of the tracks and the breaking of the rainstorm were almost simultaneous. For several weeks laborers have been working at Franklin and Lafayette Streets, cutting an opening for ventilating the subway. Several water mains, leading from the Central Park Reservoir, had been moved. Among them was a 36-in. main, which was shifted about 10 ft. While it was out of place the water was supposed to be cut off. Degnon & Company, the contractors in charge of the ventilating work, had been notified that the pipe had been isolated and could be shifted. Just before the storm broke the supposedly "dead" pipe had been cut through. Preparations for the removal of the water remaining in the pipe had been made by putting a small pump in position. If it had not been for the sudden rain everything might have passed off as planned. As it was, however, the drainage from five streets poured into the subway, and the laborers were finally forced to abandon their position. When the storm was at its height the water main itself burst and the water splashed through into the subway.

THE PROPOSED LINE OF THE SOUTHERN KANSAS RAILWAY, LIGHT & POWER COMPANY

The Southern Kansas Railway, Light & Power Company has been organized to construct a single-phase interurban railway system in southeast Kansas and southwest Missouri. The capital stock of the company is $4,000,000. The officers are: R. C. Rawlings, president, Chanute, Kan.; J. W. T. Stephens, vice-president, New Orleans, La.; L. Rosenthal, treasurer, Chanute, Kan.; F. C. Dixon, secretary, Chanute, Kan., and J. J. Jones, Chanute, Kan.

This road is to start at Chanute, Kan., and runs from there to Thayer, Parsons, Mineral, Scammon, Columbus, Galena, in Kansas; thence to Joplin, Webb City, Carterville, Carthage, in Missouri. A spur will extend also from Parsons to Cherryvale, Independence and Coffeyville, Kan. The length of this projected line is 160 miles. It passes through a rich oil and gas field, thence across a fine farming country, thence across a coal belt, and from that into the great zinc and lead producing district of Missouri.

The main power plant will be located at Chanute, Kan., with sub-stations located as desired. Chanute has been chosen for the location of the main power plant, for the reason that at this point natural gas can be purchased at 2½ cents per 1000 cu. ft., besides which it is intended as soon as this line is completed to extend the main line north to Kansas City, thus throwing the power plant practically in the center of the system. The road will be equipped for the handling of both passenger and freight traffic, and a large volume of freight business has already been pledged. The company's plans also include the equipping of five pleasure parks at different points along the route.

The topography of the country to be traversed by the proposed railway is such that the cost of grading will be comparatively low.

PROGRAM OF THE AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' CONVENTION

The official program of the meeting of the American Street and Interurban Railway Accountants' Association, to be held at Columbus, Ohio, Oct. 16-18, in conjunction with the annual meeting of the American Street and Interurban Railway Association, as just announced, is as follows:

Tuesday, Oct. 16, 1906—10:00 a. m. to 12:30 p. m.

Call to order.

Address of welcome, by P. V. Burington, secretary Columbus Railway & Light Company, Columbus, Ohio.

Address, Hon. W. Caryl Ely, president American Street and Interurban Railway Association.

Address, B. V. Swenson, secretary American Street and Interurban Railway Association.

Annual address of president, W. B. Brockway.

Annual report of executive committee.

Annual report of secretary and treasurer, E. M. White.

Appointment of convention committees.

Tuesday, Oct. 16, 1906—2:00 p. m. to 5:00 p. m.

Paper, "The Accounting of Capital Expenditures," by P. S. Young, comptroller Public Service Corporation of New Jersey, Newark, N. J.

Question Box.

Convention photograph.

Wednesday, Oct. 17, 1906—Morning in joint meeting with other associations.

Wednesday, Oct. 17, 1906—2:00 p. m. to 5:00 p. m.

Paper, "The Use of Curves in Statistics," by A. Stuart Pratt, general auditor and treasurer Stone & Webster Companies.

Report, committee on standard classification of accounts.

Election of officers.

Wednesday, Oct. 17, 1906—8:00 p. m.

Informal reunion and dinner.

Thursday, Oct. 18, 1906—10:00 a. m. to 12:30 p. m., 2:00 p. m. to 5:00 p. m.

Review, "Depreciation as Applicable to Electric Railways," by Robert N. Wallis, treasurer Fitchburg & Leominster Street Railway, Fitchburg, Mass.

To be followed by discussion. This meeting will be an executive session.

Installation of officers.

BALTIMORE & ANNAPOLIS SHORT LINE AND MARYLAND ELECTRIC RAILWAY COMPANY CONSOLIDATE UNDER TITLE OF THE LATTER

Stockholders of the Baltimore & Annapolis Short Line have voted to consolidate with the Maryland Electric Railway Company under the name of the Maryland Electric Railway Company. Under the plan the holders of the $350,000 Short Line stock will receive three shares of the new for each share of Short Line stock held by them. Prior to voting on the consolidation the stockholders authorized an isue of $1,000,000 of first mortgage bonds to defray the cost of electrifying the line. It is unlikely that more than a third of this amount will be issued at this time. This is another step in the execution of the new financial plan of the United Railways & Electric Company. The new bonds of the Short Line become an underlying issue of the Maryland Company, which at an early date will authorize an issue of $8,000,000 first mortgage 5 per cent twenty-five-year bonds; $4,000,000 will be isued at once, and the proceeds will be used in building car houses, terminal stations and extensions to be leased to the United Railways & Electric Company at an annual rental equal to 6 per cent on the actual cost of the property. A syndicate has already been formed to underwrite the $4,000,000 bonds. The Maryland Company has organized by electing the following directors: John Wilson Brown, S. B. Brown, Austin McLanahan, Joseph C. France, Frank S. Hambleton, Harman B. Bell, Edwin S. Baetjer. The officers elected are: John Wilson Brown, president; S. B. Brown, vice-president; George May, secretary; Austin McLanahan, treasurer.

It is announced by President F. T. Read, of the Trinidad (Col.) Street Railway Company, that an extension of the local system will be made to Riley Canon, a distance of 5 miles.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED JULY 24, 1906

826,551. Electric Signal; Allen B. Dungan, of Allentown, Pa. App. filed Oct. 17, 1905. A lever arm having a cam roller is pivoted above the trolley conductor so as to be displaced by the passage of a car. The movement closes a signal circuit which displays signal lamps within the block.

826,560. Loop the Gap Apparatus; Maurice Garanger, of New York, N. Y. App. filed Dec. 5, 1905. Provides an inclined track having a cam incline at its lower terminal end which acts upon a roller carried by the vehicle to impart a somersault to the latter when crossing the gap.

826,565. Trolley Stand; Boniface A. Grasberger, of Richmond, Va. App. filed Aug. 17, 1905. The trolley pole is normally held in raised position by a spring acting through toggle links. A sudden upward movement of the pole, however, displaces the links so that the spring becomes ineffective, and the pole drops.

826,627. Slow Release Magnet; Louis H. Thullen, of Edgewood, Pa. App. filed Dec. 22, 1903. Details of a magnet employed in railroad signal mechanism of a prior patent. The magnet has means for holding its circuit closed after the exciting current has ceased, so as to prolong the magnetization by the "extra current."

826,664. Life Guard Fender for Wheels; Joseph P. Kane, of Renovo, Pa. App. filed May 12, 1906. The wheel is completely surrounded by a cage formed of angle irons and sheet metal straps, all of which are supported by the journal box.

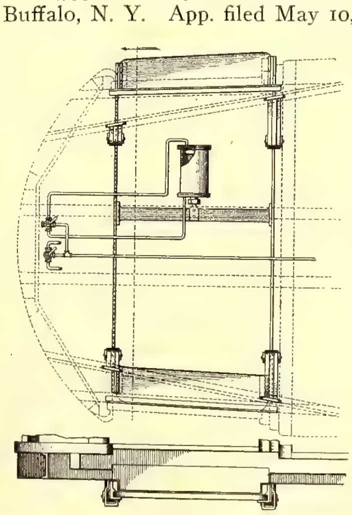
826,768. Wheel Guard; Edmund P. Craley, of McKeesport, Pa. App. filed April 30, 1906. A solid metal block depends from the brake-shoe in front of the wheel, so as to form a fender.

826,774. Street Railway Switch; Chas. W. Faitoute, of Summit, N. J. App. filed Jan. 25, 1905. A pair of tappets are inset in the rail so as to be selectively depressed by a bearer or wheel carried by the car. The tappets are guided in a curved channel so as to directly move the switch point.

826,780. Brake Setting Device; Ellsworth Godley, of Springfield, Ill. App. filed Feb. 16, 1906. A chamber connected with the usual air hose has a small weight therein which is displaced by violent movements of the car, so as to release a detent and open a valve to apply the brakes.

826,780. Trolley; John Grundl, of Pittsburg, Pa. App. filed Dec. 11, 1905. A pair of plates are pivoted to the usual harp and have cam rollers by which they are guided into upright position when passing hangers. The plates have cheeks which enter grooves in the hangers to prevent displacement of the trolley wheel.

826,799. Trolley Pole Controller; Andrew L. Prentiss, of Buffalo, N. Y. App. filed May 10, 1905. The trolley harp forms an independently moving section at the upper end of the pole and any sudden movement, as when the wheel leaves the wire, trips a valve to actuate the retrieving air cylinder.



NO. 820,926

826,926. Car Step; Delbert A. Faut, of Chicago, Ill. App. filed Jan. 23, 1906. Each of the steps are slideable in and out from beneath the car. The two steps are connected together and are moved simultaneously by an air pressure cylinder.

826,961. Car and Engine Replacer; Archibald M. Peebles, of Meadville, Pa. App. filed April 18, 1906. A metallic shoe is formed to straddle the track rail and has a small switch point thereon so as to guide the wheel flange to the proper side of the rail.

826,999. Electrically Operated Block Signal System for Railroads; Lester Dickey, of Perry, Ia. App. filed Dec. 6, 1905. Danger and caution signals are both connected to be operated by an electric motor through a reduction gear connection. A form of magnetic clutch is effective to select the appropriate signal to be actuated.

827,054. Railway Signaling System; Chas. P. Breese, of Norfolk, Va. App. filed Aug. 11, 1902. Provides a contact conductor having a plurality of contact sections and a signaling means which is controlled by the current fed to each of said sections. Has a shunt resistance to the motor to allow at all times a sufficient quantity of current to pass to the car to cause the operation of the signaling means.

Reissue, 12,510. Electric Controlling Device for Cars; James H. K. McCullum, of Toronto, Can. App. filed June 18, 1906. A complete diagram of circuits by which the motors are able to generate a current for the braking action when desired, all under control of the motorman.

UNITED STATES PATENTS ISSUED JULY 31, 1906

827,090. Trolley Pole Head; John M. Fleming, Ottawa, Can. App. filed July 13, 1905. The trolley wheel is swiveled on a vertical axis within a supporting framework and a spring blade is normally effective to keep the wheel in its proper plane.

827,122. Railway Signal System; William E. Schieble, Miamisburg, Ohio. App. filed March 24, 1905. A block signal system for single-track trolley roads. Relates mainly to mechanical construction of a detent for positioning a circuit closing wheel. Two detents co-operate to absolutely lock the wheel after movement.

827,142. Switch and Signal Apparatus; Clarence W. Coleman, Westfield, N. J. App. filed Nov. 2, 1903. Relates to signal systems operated by liquid carbonic acid gas stored at local points in tanks placed underground so as to be free from temperature variations. Has an explosion chamber and a system of valves for maintaining uniform pressure in the operating cylinders.

827,189. Electric Railway; Bartholomew M. Stack and James F. Burns, Chicago, Ill. App. filed Sept. 1, 1905. A trolley road of the type having contact plates in the roadbed and longitudinal conductor depending from the car. The contact plates are deeply set in grooved insulating blocks which serve to guide the conductor.

827,240. Car Step; Charles C. Hummel, Espy, Pa. App. filed Feb. 8, 1906. A car step for railway trains which can be thrown over by a lever system to constitute a platform when the train is in motion.

827,269. Electric Signaling; Jacob B. Struble, Wilkinsburg, Pa. App. filed March 12, 1902. An alternating current magnet in which the fields are energized by the track circuit while the armature has a pair of closed circuit coils in which a current is induced when the field current is alternating. This causes the armature to respond and be deflected for alternating current in the field, but not direct currents.

827,270. Electric Signaling; Jacob B. Struble, Wilkinsburg, Pa. App. filed March 12, 1902. A modification of the above in which the fields are energized by the track circuit and the armature is connected to the alternating power circuit. The reaction in case of alternating currents in the fields produces a displacement to close a signal circuit, but not in case of direct currents in the fields.

827,294. Track Sander; Fred B. Corey, Schenectady, N. Y. App. filed Feb. 15, 1904. A sand ejector having a nozzle for compressed air and an annular passage thereabout through which the sand normally flows by gravity.

827,313. Pleasure Railway; August Lauster and Frederick Pounds, Paterson, N. J. App. filed Feb. 21, 1906. The railway is led through a tunnel having closed sides so that the pasengers may have the experience of seeing the objects under water.

827,320. Motor Control; Jakob E. Noeggerath, Schenectady, N. Y. App. filed Nov. 17, 1905. A system by which motors may be connected in series without danger. A unipolar dynamo is connected in parallel with all the motors and taps from the armature thereof are led from the potential motors so as to keep the distribution uniform.

827,323. Electromechanical Switch-Thrower; James A. Posey, Midlothian, Tex. App. filed Sept. 14, 1905. The track switch is actuated in the usual way by taking current or not at the car controller in passing. The switch point is thrown by a mechanical tappet actuated by the weight of the car, selector levers being electrically positioned to determine the direction of throw.

827,325. Non-Reversing Two-Way-Running Trolley Pole; Hilary Quertier, Dunedin, New Zealand. App. filed Oct. 9, 1905. The trolley pole projects vertically from the roof of the car and is held in said relation by spring impelled struts which are directed thereagainst in a forward and rearward direction.

827,344. Trolley Retriever; Terry Blixt, Pittsburg, Pa. App. filed July 3, 1905. The trolley cord is reeved through a pulley on the pole and connected to a spring drum at each end. One spring drum normally tensions the cords and the other spring drum retrieves it when released by sudden movement of the pole acting to displace a lever through which the cord is guided.

827,395. Railway Switch; Henry A. Rosback, Chicago, Ill. App. filed March 19, 1906. In place of the usual frog the patentee provided a form of frog with a movable central point which is moved from side to side by a lever connection with the switch point.

827,407. Switch Mechanism for Railways; Thomas Bamford, Lebanon, Ill. App. filed April 27, 1906. The switch point is connected to a long spring blade adjacent to the track rail and a depressible bearer on the car bends said blade inward to throw the switch point.

827,411. Railway Traffic Controlling Apparatus and System; Henry Bezer, Westfield, N. J. App. filed Jan. 23, 1905. An arrangement of circuits for a block signal of the overlap type having track rails energized by a direct current and utilizing polarized rails.

827,446. Railway Car Seat; George H. Hopkins, Chicago, Ill. App filed April 9, 1906. A seat for the motorman of an electric train having a lever connection by which it is moved downward to constitute an ordinary passenger seat.

827,476. Rail Joint; James M. Tadlock, El Reno, Okla. Ter. App. filed Oct. 6, 1905. The rails are formed to have a splice joint, two engaging walls of such rails being grooved to constitute mortise and tenon connection.

827,628. Safety Block Signal; Lonzo V. Greene, Webster, Mass. App. filed April 28, 1906. A mechanical block signal having depressible bearer plates in the roadbed adapted to be engaged by suitable levers on the train, whereby the signals are set, and chain and rod connections to the distant signal.

827,681. Electric Railroad; George W. Browne, New York, N. Y. App. filed Feb. 23, 1905. The third rail is sectionally energized during the passage of a train. Tappets adjacent to the rail are engaged to throw knife-blade switches and charge the rail in advance of the train.

827,683. Signal Apparatus; Clyde J. Coleman, New York, N. Y. App. filed May 7, 1902. A system for the operation of semaphore signals by local reservoirs of liquid carbonic acid gas. Has claims on the utilization of liquefied gas at local points for signal purposes.

PERSONAL MENTION

MR. H. D. HAGGERTY has been appointed general manager for the Little Rock Railway & Electric Company, to succeed Mr. C. O. Simpson, resigned.

J. G. WHITE & COMPANY, of New York, announce that Mr. E. N. Chilson has been appointed purchasing agent of the company, and that Mr. E. V. Peters will continue to act as assistant purchasing agent as heretofore.

MR. FRANK R. PHILLIPS, of Cincinnati, has been appointed chief engineer of the Michigan United Railways Company, and will have his headquarters in Lansing. Mr. Phillips held a similar position with the South Covington & Cincinnati Railway.

MR. H. P. BRUCE, formerly general manager of the Demerara Electric Company, of British Guiana, and lately a member of the firm of Rockwell & Bruce, of 26 Cortlandt Street, died suddenly in New York on July 26. Mr. Bruce leaves a wife and one child. Mr. Bruce entered the electrical field in the early days of the Thomson-Houston Company, and had charge of some of the largest work in the East. Before going to Demerara, where he was located for from two to three years, Mr. Bruce was associate engineer of the Pittsburg Railways.

MR. H. A. JOHNSON, who for twelve years has been identified with the South Jersey division of the Public Service Corporation of New Jersey, as chief engineer of the railway department, resigned his position Aug. 1. He will at once go to Davenport, Ia., where he has accepted a position as general superintendent of the Tri-City Electric Railways & Lighting Company. Mr. J. N. Akarman, from the North Jersey division of the Public Service Corporation, and formerly of Worcester, succeeds Mr. Johnson. He has been given the title of general superintendent of railways, South Jersey division.

MR. DANIEL B. BANKS, who as chief engineer had charge of all the track and other construction work of the United Railways & Electric Company, of Baltimore, has resigned to take up independent consulting work. It is said that the company will not name successors, with like authority, to Mr. Banks and to Mr. P. C. Keilholtz, who resigned lately as consulting engineer. Part of their duties will be filled by the staff of Mr. L. B. Stillwell, of New York. At the present time Mr. Stillwell's electrical assistants are making an examination of the Pratt Street power station.

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Of this issue of the Street Railway Journal, 8000 *copies are printed. Total circulation for* 1906 *to date,* 269,600 *copies, an average of* 8171 *copies per week.*

Pump Locations in Power Plants

The location of pumping machinery in a power plant depends so largely upon the available space that in many cases the designer has little choice in the matter. Fortunately there is a wider latitude usually to be found in the location of equipment in a railway plant than in an installation for office building or hotel service. In some of the higher-class isolated plants, a separate room is now provided for pumps, and there is no doubt that in certain railway generating stations such a course would be advantageous.

In some cases the pumping equipment is installed in the engine room, and the principal advantage of so doing is the increased amount of attention the pumps receive from the engineering staff of the station. In general the boiler room is not an ideal place for moving machinery, and although steam-driven feed and circulating pumps are rugged pieces of apparatus, there is no question that constant exposure to coal dust and dirt increases the rate of depreciation. Pumps and piping need care as well as anything else, and it is too much to expect the same attention in the boiler department as in the engine room.

The location of pumps in the engine room is open to the serious objection that such a course tends to crowd the equipment too closely together in plants where there is quite a number of pumps to be installed. Aside from boiler feed pumps, many plants are equipped with air and circulating pumps for condenser service, step bearing turbine pumps, oil pumps, drainage, artesian well and fire pumps. The piping complications which these entail are a disadvantage to the free movement of objects in the engine room, and to the clear vision of the operating force. The most modern stations are conspicuous for the way in which similar equipment is co-ordinated in groups of operating units; ample clearance is allowed between units, and the grouping plan permits the widest flexibility in case of trouble. Thus, if all the boiler feed pumps are installed in a parallel row in a separate pump room, the piping can readily be arranged to enable any pump to take up the load with minimum loss of time in case of trouble. If the pumps are scattered promiscuously around in odd corners the pipe layout can not be as simple and hence as low in first cost, or the control as immediate and concentrated. Air and circulating pumps are almost always installed in the basement close by the condensers which they serve, but there is often the same opportunity for co-ordinating these in a group, with the feed and oil pumps, step bearing pumps, etc., that there is when the pumps are located in a separate compartment on the floor above. The pump installation ought to be well under the hands and eyes of the operating shift, in any case, and the plan of segregating this equipment in a group apart from the boiler and engine room apparatus is well worth bearing in mind in designing new plants. There is no reason why traditional practice in the location of pumps in the boiler room should not be departed from in cases where it seems advisable.

The "Everybody Busy" Principle

Overworking men in the services of an electric railway company is not to be advocated, but it is certainly the part of a good manager to get a full day's work out of every employee on the system. Some companies do not get all the work out of their men that could reasonably be expected,

and, further, it is the fault of the companies themselves that they do not do so. There are many duties about a system that require practically nothing but the constant attendance of a man and necessitate very little actual work on his part. Again, there are many odd jobs upon which these men could work without interfering with their duties. Considerable economy would be effected if men in such positions were given enough work to keep them busy. The sub-station attendant, for instance, could undertake small electrical repairs, or probably he could be kept busy winding armatures. After starting the apparatus in the morning there is generally little to be done except to throw a circuit breaker occasionally. Of course, at times, in case of derangement of the apparatus, his whole attention is required for several hours continuously; but, ordinarily, a great deal of electrical repair work could be obtained from the average sub-station attendant without any interference with his duties, and he would probably be better satisfied with his work through being relieved of some of its monotony. Some companies employ for sub-station attendants low-priced men who are not mechanics and who would not be capable of doing electrical or mechanical work. This is sometimes done in view of the fact that derangement of sub-station apparatus is so infrequent that the services of a high-priced man are seldom required. For cases of this kind a lower grade of work can often be found. For instance, the attendant could be trained to take care of the headlights and marker lights, which may then be left with him by the train crews. On the other hand, by adding armature winding or electrical repairs to the sub-station man's duties, a company can afford to put a better man in a sub-station than if he is to be idle most of the time.

In addition to sub-station attendants, there are others who might be kept busier. Switchmen are often kept at points where their duties are such that they could be given extra work, and sometimes it is necessary to maintain station agents at points where the regular duties require a small portion of their time. In the latter case, the clerical force in the central office might be diminished by distributing some of the work to the otherwise idle agents. The emergency line crews also could be kept busy at some kind of work when on duty.

A great deal of enforced idleness of men is caused by delays of train crews on sidings. A Western interurban road, realizing the savings possible by keeping everybody busy, is building a line car large enough to contain a workshop in which apparatus can be repaired and line material gotten ready for use. A work bench of convenient size is built along one side and necessary tools, supplies and repair parts are kept at hand. Often the line car is delayed on a siding for an hour or more at a time, and in such instances on most roads the crew has a good excuse for loafing. With this car there will be no occasion for this, as there will be almost as good an opportunity to work as when in the shop.

In demanding extra work from men with regular duties, care should, of course, be taken that the extra work does not interfere in any manner with their regular duties. They should be given to understand that the extra work is of secondary importance.

When attempts are made to introduce the "everybody busy" principle, there will, to be sure, be serious objections on the part of some of the workmen, but not from the best ones. It would, of course, require a little thinking on the parts of heads of departments to keep all their men busy, but in most instances a little attention to this detail of managing will pay good returns in the resulting cutting down of the cost of labor.

Care of the Water Coolers on Cars

It is certainly aggravating to a traveller on a hot, dry day to approach a water cooler on an interurban car and find it either empty or filled with lukewarm water or with a fluid so muddy and so dirty that the bottom of the cup cannot be seen. It would be far better not to provide a water cooler on the car than to have one not properly taken care of and which invites simply to disappoint.

The care of water coolers is of such importance that on interurban systems operating ten or fifteen cars or more, if possible, one man at a central point should be made responsible for their condition. If it is nobody's duty in particular to fill them and supply them with ice, it is almost an assured fact that they will be empty or the water in them will be warm as often as otherwise. The most important point to be remembered in their care is to use a good quality of water. It is often the practice to put in water from a city system which is of such a quality that the people ordinarily do not regard it as fit to drink. If this kind of water is all that is available, a filtering plant should be brought into service. On the larger systems where storage batteries are employed in the power house or sub-station, there is usually a still in the power house for purifying water for use in the storage batteries, and water from this still may be used in the coolers. Distilled water, to be sure, has a rather flat taste, but when iced it is not so objectionable.

Of second consideration, but also of importance, is the supplying of ice to the cooler. When people go to a cooler expecting ice water, they are likely to express their opinion of the care of the traveler by the operating company in a rather forcible manner when greeted with a lukewarm stream.

Another point to which attention should be given is the kind of cup kept with the cooler. Evidently some companies go on the principle that it is best to have an old, rusty cup that no one would have rather than provide one decently clean and have it stolen. But cups are cheap. The ordinary tin cup can be purchased for about 2 cents, and it would be far better to lose one by theft occasionally rather than to supply a dirty, rusty cup which would make any water taste bad, and which in all probabilities would assist in spreading disease. The suggestion to scald with boiling water or wash out the interior of the cooler with soda water and a brush or to give it a thorough cleaning in some other manner at frequent intervals may at first thought appear to many to be pushing the matter of the care of water coolers to an extreme. But a little consideration of the faults and shortcomings of the present type of cooler will show it to be a very sensible suggestion.

This gives us opportunity to say a word regarding the type of water cooler usually found in both steam and electric coaches. The opening inside is so deep and narrow that it is very difficult to clean them, and further it is almost impossible to tell when they are dirty. It might be argued that if nothing but pure water is put into them that there is no occasion for their getting dirty. But when one is reminded of the condition in which glass water pitchers get when not washed at frequent intervals, the argument will have very

little support; and, further, clear water is not always supplied. Even if the water did not soil the coolers, there are other ways whereby they become unfit for use if not washed frequently. A car is often kept in the shops for a month or more at a time for repairs, and during these intervals the cover is not always on the water cooler. It may have fallen off or, owing to a lack of covers, the cooler may have been "robbed" of it for use on a car in service. Of course, the passenger knows nothing about the inside condition of the water cooler, but it is safe to say that if he did he would not be so eager to get a cool "refreshing" drink out of it, even if he carries his own private drinking cup.

It appears that, in general, improvements in water coolers for cars have not kept pace with the general progress in car construction and the developments of sanitation. The coolers in use at the present time are practically the same as those employed several years ago. At a cursory glance it appears that improvements could be made somewhat along the line of the type of cooler frequently found in offices. In this type an inverted glass bottle containing the water is supported above a chamber in which are placed ice and cooling coils. The feature of this type of cooler that would be highly desirable in a railway car cooler is that the water and the condition of the greater part of the retaining vessel as regards cleanliness can be seen. The railway system which first adopts a satisfactory cooler will certainly gain in favor with its patrons.

Until some improvements are made, certainly more attention should be bestowed upon coolers, and in the interests of general health they should be given frequent scaldings and cleanings.

The Worker Under Public Ownership

We have recently received a paper by H. T. Newcomb, Esq., on this topic, which ought to be read by every one who has been bitten by the municipal ownership idea. It was read a few weeks since before the American Association for the Advancement of Science, so that it will be readily available to the public. It is a keen, if somewhat acrid, analysis of the claims of the advocates of municipal and State socialism. We do not agree with all the opinions of the author, who, very evidently, holds a brief for things-as-they-are, but certain points not commonly considered are brought out with great force. Mr. Newcomb's view is largely moulded upon observation, and perhaps experience of the Government as an employer. With its hard knots of red tape, its unbending system and the frequent parsimony of Congress, the position of the Washington or other Government employee is not altogether enviable. In the pay of its higher positions, Uncle Sam is notoriously stingy, the head of a great department getting pay not one-half what would be considered a fair recompense for the same responsibility in civil life. Yet, on the other hand, taking the rank and file of the clerical force, one reaches another conclusion, for the average pay on a per hour basis is on the whole unusually good—better than that under private employment for the same grade of labor. This is in fact one of the very weakest points of municipal ownership—that the tendency would be toward insuffcent pay of the responsible heads and large pay for short hours as regards the great mass of employees with votes. If Mr. Newcomb's claim of poor pay were justified, one would be forced to the conclusion that the supply of labor for Government employ would be small rather than large. It is quite true, as Mr. Newcomb states, that, in spite of the increased cost of living, Uncle Sam has not naturally increased the pay of his force, but, for that matter, neither has the private employer, save when driven to it; and during the steady rise of living costs, wages have been repeatedly cut down under private management, while the Government employee has been holding his own.

No, municipal laborers at least are likely to get all they are worth so long as they keep in close touch with the machine, in which respect they perhaps differ from the Washington force which Mr. Newcomb has in mind. And there are no restrictions against municipal employees pulling any ropes they can to get an increase of pay. It is perfectly true that Government employees are estopped from employing Mr. Newcomb or any of his brother attorneys from lobbying in their behalf, and it is well that they are, for there is too much lobbying all the time for any decent citizen to contemplate with patience. We can hardly imagine so sensible a restriction being placed on the workmen of a municipally-owned railway. On the contrary, the whole force would pretty certainly be voted in regular blocks and have its wages fixed to suit the bosses. As to chief officials, these would be heelers of the sort usually found in street departments, and we can hardly imagine a municipal tramway put in charge of the best available men, irrespective of party or residence. Mr. Newcomb makes one very strong point in favor of private employment in bringing to the front the fact that civil-list pensions are unknown in this country, while the pension is rapidly becoming a common feature in the large corporations engaged in quasi public works. A civil list would be perhaps the finest opportunity for graft ever made available, and for a municipal civil list we have no adequate words available. The corporation pension schemes have not been long tried, and their continuity of purpose may sometimes be open to question, but they exist and do pay pensions to the veteran workman's great benefit. Public ownership could hardly embody pensions without great risk, and, as Mr. Newcomb intimates, is likely to limit the individual freedom of the workman. This is already limited by the procedure now possible under injunction proceedings, and we fail to see how a workman would be less free to strike under municipal ownership than he now is—if such freedom be considered an essential part of personal liberty. Frankly, Mr. Newcomb's diatribe against restrictions placed on contract breaking by employees does not ring true. If the employer can be held to his contract or criminally prosecuted for conspiracy in case of a black-list, why should the other party to the contract be irresponsible? We do not believe that the sensible American workingman wants "liberty" of this kind. In point of fact, the restrictions placed by some corporations are quite as objectionable, for instance, those of the workmen in the South African diamond fields. Of such possibilities Mr. Newcomb's paper says nothing. That there are abuses in the Washington red-tape office is notorious, but they are not the same in kind or degree that would be found in municipal ownership of tramways for instance. It is well to have the public understand that Government employment is no bed of roses, and the paper under discussion makes this point painfully clear. The objections to municipal ownership are only too well known even from present experience. Let us have none of it, until human nature is regenerated, in any form which has yet been devised.

THE ELECTRIC CAR EQUIPMENT OF THE LONG ISLAND RAILROAD—II*

BY W. N. SMITH

ELECTRICAL EQUIPMENT

The selection of the electrical equipment of the motor cars of the Long Island Railroad, whether operated singly or in trains, required the most careful study of the loads to be handled, the schedule conditions under which the apparatus is to be operated, and the limitations of the apparatus itself. Whether all cars of a train should be motor cars; whether all axles of the motor cars should be equipped; what the motor characteristics, the ratio of gearing, and the wheel diameter should be; the maximum speed that could be depended upon to make up time, and the amount of time to be allowed for "laying over" at terminals, were, among others, considerations of the utmost importance in coming to a decision on the equipment that would most economically serve the purpose of the Long Island Suburban lines.

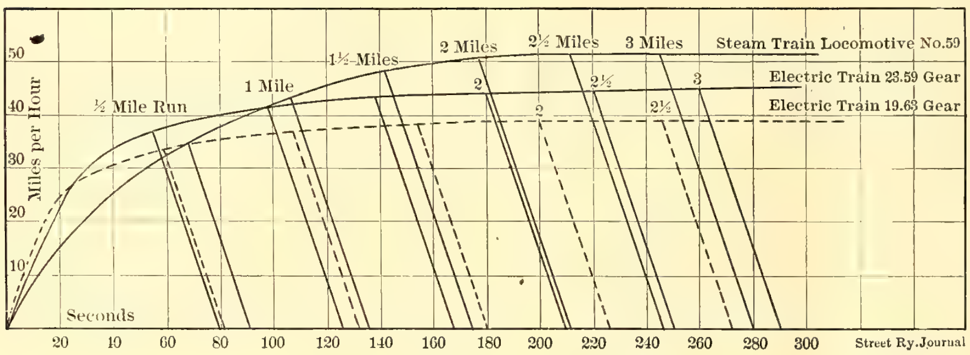


FIG. 17.—SPEED TIME CURVES

The variable number of motor and trailer cars per train caused some variation in the load per motor on different trains. There were also various classes of express and local service to deal with, involving different schedule speeds and average lengths of runs between stops, for all of which it was desirable to provide a uniform equipment, so that any car could be devoted to any desired type of service without discrimination. The motor equipment to be adopted must handle traffic efficiently under any and all of the varying conditions of train weight and schedule speed that occur in the operation of the suburban lines of the Long Island Railroad.

Careful investigation showed that the greatest flexibility would result from a two-motor car equipment, using the most powerful motors practicable. The limitations were mainly the dimensions imposed by the largest trucks that could be operated under the conditions prescribed by the tunnel and curve clearances, which restricted the wheel base of the motor truck to 6 ft. 8 in. This restricted the size of the motor to about 200 hp, and the study of the conditions was consequently reduced to an examination of the characteristics and gear ratio most suitable for this motor, and of its power of endurance to resist overheating.

At the outset, a series of speed tests was made on various steam trains of the Long Island Railroad in order to compare the actual running time with that laid down in the time tables, and with the times which the railroad officials desired to be met by the electrical equipment. An ordinary passenger coach was fitted with speed-recording devices and a number of speed curves were obtained. The best performance of a relatively light steam locomotive train weighing 171.9 tons with the locomotive is shown in Fig. 17. The difference in the running time of an equivalent electric train is shown in the same diagram, and in general indicates that for all average lengths of run between stops in suburban service up to about two miles the electric train is the faster. The average length of a run over the Atlantic Division, the first to be equipped, was originally estimated at 1.6 miles, but in practical operation since the road was equipped this has been reduced to about one mile, giving the electric trains a still greater advantage in speed, due, of course, to their higher rate of acceleration. These same tests also threw some light on the time to be allowed for various delays to which the trains were likely to be subjected, and, together with the actually derived speed curves and calculated best performance curves, showed the relation between the schedule time ordinarily allowed for a train on a given run and the best time that it could possibly make over the same distance.

An idea of the scope of the problem may be had from the statement that there had to be compared about twenty-three different types of train runs, local and express, on eight different routes, with the average distance between stops (herein called average length of run), different in practically every case. The results given in the accompanying table show a comparison of steam and electric runs of average length, based upon the curves mentioned, and others of similar character. The runs in this table are partly express and partly local; for the sake of simplicity the elapsed times of each run shown are those made by a three-car train, although the length and weight of train was in practice expected to vary considerably on some of the lines at different times of the day. The general solution of the problem was worked out by the aid of speed-time curves.

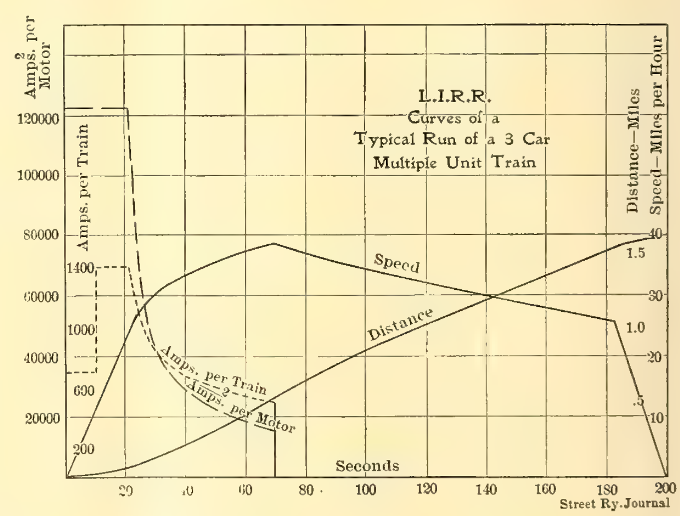


FIG. 18.—CURVES OF A TYPICAL RUN OF A THREE-CAR MULTIPLE-UNIT TRAIN

Considerable work was done in the early stages in comparing results previously obtained by former experimenters with a view to determining the train resistance which had to be properly assumed in order to compute the speed of trains, and the power required by them. With this data secured, the next step was to determine, first, the schedule speeds that

* For previous articles on the Long Island Railroad electrification, see STREET RAILWAY JOURNAL for Nov. 4, 1905; April 7; June 9, 16 and 23, and Aug. 11, 1906.

could be maintained by certain motor and train combinations; second, the heating effect upon the motors when run continuously through the cycles of operation representing the average length of run, and the minimum permissible lay-over at the end of a run, for trains in continuous operation; and third, the power consumption of the system, with average and maximum service.

The schedule speeds were derived directly from the speed-time curves. The most rational method available for estimating the heating effect developed in each motor was to compute the "square root of the mean square" current per motor, averaged over the entire time of any given run or succession of runs, and to compare it with the limiting value set by the manufacturers for the motor selected. The power consumption was easily computed from the current-time curve corresponding to each speed-time curve. The time-distance curve was used to determine the location of the amount of current at any instant, thus enabling the ready computation of third-rail and track drop, and the distribution of load between sub-stations. Fig. 18 gives each of these curves for a typical run of three-car, multiple-unit trains.

The general result of the motor computations, as determining the size of the car equipment, was that a medium gear ratio (25:58 for the No. 113 Westinghouse motor) was fixed upon and the number of motor cars and trailers per train was recommended in accordance with the following table:

Length of Train.	Local.	Express.
Two-car train.	Two motor cars. No trailers.	One motor car. One trailer.
Three-car train.	Two motor cars. One trailer.	Two motor cars. One trailer.
Four-car train.	Three motor cars. One trailer.	Two motor cars. Two trailers.
Five-car train.	Three motor cars. Two trailers.	Three motor cars. Two trailers.
Six-car train.	Four motor cars. Two trailers.	Three motor cars. Three trailers.
Seven-car train.	Four motor cars. Three trailers.	Four motor cars. Three trailers.
Eight-car train.	Five motor cars. Three trailers.	Four motor cars. Four trailers.

Two motors are used per car, and both motors are mounted on the same truck.

DATA FOR SUBURBAN RUNS—L. I. R. R. TRAIN SHEETS FURNISHED BY L. I. R. R. CO., NOVEMBER 6, 1902 AND JANUARY, 1903. OMITTING RUNS WHERE NUMBER OF STOPS IS SAME AS HEREIN, BUT TIME AT STOPS IS LESS

RUN.	Distance. Miles.	Run, Letter.	Time, Minutes.	Train Sheet Schedule Speed, Entire Run.	Intermediate No. of Stops per Trip.	Time Out for Stops.	Average Length of Run, Miles.	Time of Average Run, Minutes.	A. Average Speed Between Stops, M.P.H.	B. Limit Average Speed Best Steam, M.P.H.	Ratio A./B. % Steam.	C. Limit Average Speed, Elec. Train 23–59 G. Ratio.	Ratio A./C. % Elec.
L. I. City—Port Washington.......	18.18	a	41.5	26.3	7	4.5	2.27	4.62	29.5	36.	81.9	35.5	83.2
		b	43.0	25.4	8	5.0	2.02	4.22	28.7	34.0	84.4	34.0	84.5
L. I. City—Whitestone Landing....	11.75	c	31.0	22.8	7	3.5	1.47	3.44	25.6	30.8	83.2	31.8	80.5
L. I. City—Rockaway Park.........	16.3	d	39.25	24.9	5	2.5	2.72	6.12	26.7	37.5	71.2	36.5	73.2
		e	39.0	25.1	6	2.75	2.33	5.18	27.0	36.0	75.0	35.5	76.1
		f	40.0	24.4	7	3.5	2.04	4.57	26.8	34.0	78.8	34.0	78.8
		g	41.0	23.8	8	4.25	1.81	4.08	26.6	33.	78.8	33.5	79.5
		h	43.0	22.8	10	4.0	1.48	3.55	25.0	30.8	81.2	31.8	78.7
		i	43.75	22.3	11	4.5	1.36	3.27	25.0	30.0	83.3	31.0	80.7
		j	47.0	20.8	14	5.5	1.09	2.76	23.7	27.0	88.	29.0	81.8
L. I. City—Valley Stream...........	22.97	k	59.5	23.1	11	7.5	1.91	4.33	26.4	33.7	78.4	33.7	78.3
L. I. City—Manhattan Beach........	16.1	l	37.0	26.1	3	3.0	4.03	8.5	28.5	41.0	69.5	39.0	73.0
		m	38.0	25.4	4	2.5	3.22	7.1	27.2	39.0	69.8	37.5	72.6
		n	40.0	24.2	5	3.75	2.68	5.87	27.4	37.5	73.2	36.5	75.0
		o	44.0	22.0	11	6.5	1.34	3.12	25.8	29.8	86.5	31.3	82.5
Flatbush—Rockaway Park..........	15.88	p	39.5	24.5	7	4.	1.98	4.56	26.	34.	76.5	34.	76.5
		q	44.75	21.5	11	5.	1.32	3.37	23.9	29.5	81.2	31.	77.2
		r	45.5	20.9	12	5.75	1.22	3.06	23.9	28.5	84.	30.	79.6
		s	47.	20.2	15	6.5	.99	2.53	23.5	26.5	88.6	28.5	82.5
		t	48.	19.8	16	6.75	.93	2.43	23.0	26.0	88.5	28.	82.2
Flatbush—Jamaica.................	9.63	u	19.	30.4	1	1.	4.81	9.	32.	42.5	75.3	40.	80.
		v	23.	25.1	5	3.	1.61	3.33	29.	31.5	92.1	32.5	89.2
Flatbush—Valley Stream...........	22.55	w	60.5	22.4	13	9.	1.61	3.68	26.1	31.8	82 0	32.0	82.4

MOTORS

The No. 113 motor was brought out in 1905, and was fully described in the Street Railway Journal for Sept. 23, 1905. It was the first motor built by the manufacturers to use the diagonally divided field frame. With this frame the armature can be taken out without removing the motor from the truck by lifting off the top half of the frame, or the motor can be lifted entirely from the truck by removing the gear case and axle cap. Nose suspension is employed, and the motor is oil lubricated from below.

The pinion has twenty-five teeth, 2½-in. pitch, and is cut from a solid steel forging. It is keyed to a tapered seat on the armature shaft and held in place by a nut and lock washer. The gear has fifty-eight teeth and is machined from solid cast steel and pressed and keyed to the axle. The diameter of the gear seat is 7 13-16 ins., and the face of the gear is 5¼ ins. wide. The gear case is of malleable iron, divided in halves horizontally and supported at both the front and rear ends by lugs projecting from the motor frame and housing.

CONTROL SYSTEM—MODIFICATIONS FROM PRECEDING TYPES

The Westinghouse electro-pneumatic multiple control is employed, and the equipment on the Long Island Railroad differs somewhat from that used in any other important installations made by the Westinghouse company, such as on the Metropolitan West Side Elevated of Chicago,[1] the Brooklyn Rapid Transit,[2] and the South Side Elevated Railway, of Chicago.[3]

As the principal features of the electro-pneumatic system of control are familiar to the readers of this paper, it will be necessary only in this article to point out such modifications as have been made in previous equipments and the reasons for their adoption, and include a diagram of the connections as used on the Long Island cars.

In the Metropolitan Elevated and Brooklyn systems, which were the earlier installations, the unit switches were grouped in a turret, whereas on the South Side and Long Island installations the switches are arranged in a row in a long box in such a manner that a hinged cover gives

[1] See Street Railway Journal, April 22, 1905.
[2] See Street Railway Journal, May 6, 1905.
[3] See Street Railway Journal, May 19, 1906.

access to the main contacts on one side and to the interlocking fingers on the other. The unit switches are, therefore, practically the same as those on the South Side Elevated Railway and illustrated in the issue for May 19, 1906.

The master controller, which might be considered the next important feature of the system, is the same in all of the installations, with the exception of that on the Long Island it is fitted with a connection for operating an automatic brake cut-out somewhat similar to that used on the Interborough Subway cars in connection with the type-M control. This cut-out permits the handle of the master controller, when on the central notch, to complete a circuit which energizes the emergency train brake magnet valve, immediately releasing the air from the train pipe and setting the brakes. This arrangement makes effective the "dead man's handle" feature of this type of control. If the motorman removes his hand from the master controller handle from any cause whatever, it returns immediately to the central position and sets the brakes.

On the face of the Long Island master controller there are nine notches or stops, one in the center and four on either side, which engage the spring catch of the handle. The central portion, as stated, causes an emergency application of the train brakes.

The first notch is really the "off" or coasting position of the controller, and when the handle is at this point the train brakes are not applied, but all switches, including the line switch, are open. Reversal is accomplished by moving the handle to the opposite side of the center notch.

When on the second notch or switching position, the controller establishes such connections with the train line that the reverse switch is thrown to the correct position, the line switch is closed, and the switch group closes the circuit of the motors with all the resistance in, thus effecting a slow movement of the train. This, of course, can only happen with all the train line jumpers connected up, so that the auxiliary control apparatus on each motor car is in parallel across the wires of the train line.

The third notch is the series running position, and the fourth and last notch is the multiple position.

One new feature, in addition to those mentioned, is in the arrangement of the motor cut-out switch. This switch, in the Metropolitan installation, actually cuts the motor circuits, but on the Long Island road does so by rearranging the control circuits. In Brooklyn and on the South Side Elevated it is not made a part of the control circuits. The Long Island cut-out switch is placed under one of the seats in the center of the car, and, of course, is designed to enable the motorman to cut out either or both of the motors under the car. It consists of a small drum-type controller with a permanently attached operating handle, which may be moved to four different positions under which the conditions of the motor connections are as follows: (1) Both out, (2) both in, (3) No. 1 out, (4) No. 2 out. The drum upon this control cut-out switch is provided with a number of contact segments which engage with fourteen fingers which are directly connected into the auxiliary control system. When this control cut-out switch is in the off position, none of the fingers makes contact, so that the auxiliary control system is then entirely open circuited. In the other three positions, however, the connections are so made in the auxiliary circuit or so rearranged that the desired effect is obtained by enabling only certain switches to be closed, the balance remaining open.

A line relay is used, as in the Metropolitan installation, it is not employed on the South Side Elevated nor in Brooklyn. This coil is connected across between the main motor control circuit, after passing the line switch, and the ground. That is, it is a 500-volt coil. When the line switch closes and there is a current on the motors, the coil of the line relay is energized and lifts the plunger, causing the disc to close the circuit between the contacts. These contacts are directly in series with the battery circuit of the switch group, so that if they are opened the unit switches of the switch group cannot close, and even if closed the opening of the line relay contacts, due to the cutting off of the line e. m. f. for any cause, causes the battery connection to the switch group switches to be instantly broken, and they at once drop open, cutting off the current supply to the motors. In other words, the line relay constitutes a "no-voltage" circuit breaker for the main circuit. This action takes place on each car individually, so that if the current supply is interrupted on any car the switch group on that car will be cut out independently of the other cars in the train. If the current supply is restored after being broken, while the master controller is in one of the running positions (for example, when the car traverses a gap of the third rail that is longer than the distance between its third-rail shoes), the line relay will then lift and restore the battery connections to the switch group, which will then go through the prescribed cycle of operations under the control of the limit switch as above described, and again supply current to the motors, just as if the controller handle had been thrown to the off position and then turned on again. The line relay is mounted upon the switchboard panel at one end of the car, and its object is to prevent a sudden rush of current after an interruption in this circuit, and thus avoid danger of flashing over on the motors.

The reverser and line switches are the same in all four installations. There is a difference, however, in arrangement of the line relay and limit switch, which on the Long Island car are placed on the switchboard, whereas in Brooklyn, and on the Metropolitan Elevated they are carried under the car.

Another slight variation consists in the method of charging the storage batteries. On the Brooklyn and South Side Elevated Railways they are connected to the light circuit, whereas in the Long Island and Metropolitan equipments they are charged through the pump circuit. This is done by connecting the battery in multiple with an adjustable resistance so arranged that the proper charging current will pass through the batteries when the compressor is operated, the circuit through the battery being closed by a relay mounted on the switchboard panel. The position of the battery switches on the switchboard is changed but once a day when the car is in ordinary operation.

The supply system comprises, first, the four third-rail shoes mounted upon the trucks, and previously described. Each shoe is provided with an enclosed fuse. The two shoes on opposite sides of the same truck are connected together by a cable run in conduit. From a point just above the inner terminal of one of the shoe fuses is connected the supply main, which runs direct to a switchboard panel (mounted in an enclosed space in one of the vestibules) with two taps, one of which leads through a bus fuse to a pair of bus-line receptacles at each end of the car. The bus line may be considered as a jumper run from one motor car to the next, tapping at each end through a fuse into the supply main wiring of the motor car, thus equalizing the main motor supply circuits throughout the train.

To make the operation clear a wiring diagram is presented in Figs. 19 and 20, and the connections will be briefly traced.

In these drawings the unit switch interlocks are shown in with the switches open. The master controller, line switch, reverser and cut-out switch are likewise shown in the open position. With the master controller in the central position,

the two fingers *BK* and *B*-plus rest upon the cylinder, closing the circuit through the emergency brake solenoid. When the controller is thrown to the coasting position, all the fingers are free. The next notch in the forward direction puts fingers *B*-plus, 1 and 6*A* in contact with the cylinder. The current passing from the drum over the latter finger goes through the line switch cut-out and then continues on to the main cable, which, when the connecting jumpers between cars are in place, is continuous throughout the length of the train. Leaving the central junction box of each car, the circuit being followed continues through one of the coils of the line switch, thence by wire 11 through the two circuit-breaker coils in series to wire 9 and to the motor cut-out box located under a seat in the car, where it is completed by passing to the battery over *B*-minus. The current through this path closes the circuit breaker or the line switch, and in doing so

The series position of the master controller connects finger 4 with *B*-plus. The circuit through this finger leads through the limit switch on the switchboard in the cab by way of the central junction box to the *M*1 interlock over wire *L*. It then continues over *M*1 interlock to 16, through *J* interlock to 17, by way of *JR* interlock to 18, thence over *S* interlock to the operating magnet of this unit switch. The return to *B*-minus over 12 has already been traced by way of the line relay and circuit-breaker trips. When unit switch *S* operates, connections of its operating coil are made over its interlock with *R*. Wire 18 is also connected to 20, closing the circuit to *B*-minus through the operating coil of *RR*1 unit switch. The closing of this switch closes a circuit through *R*1, and in like manner all the resistance switches are closed, *R*3 being the final one to operate.

Throwing the master controller to the multiple position

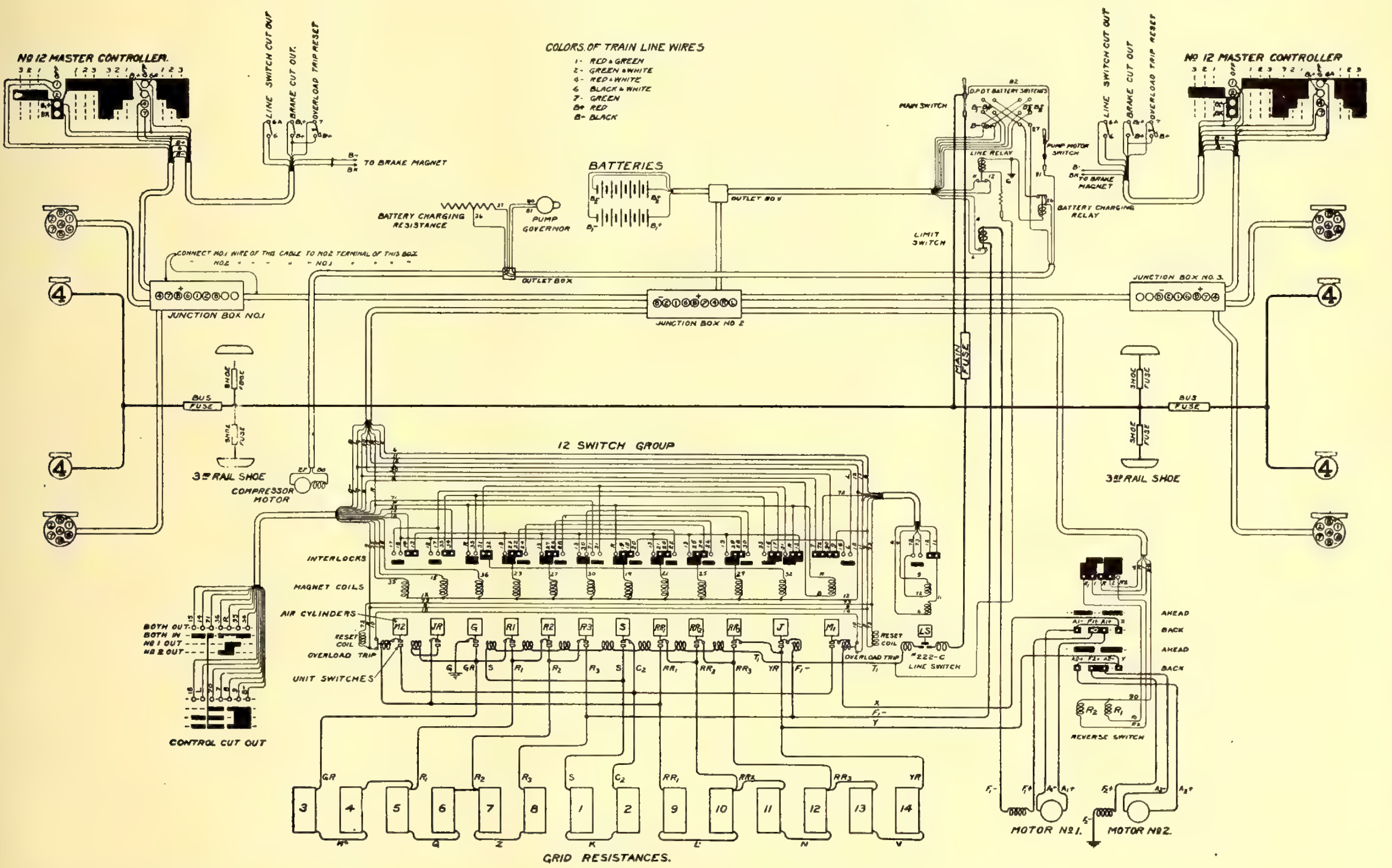


FIG. 19.—WIRING DIAGRAM OF MULTIPLE-UNIT SYSTEM USED ON THE LONG ISLAND RAILROAD

makes the circuit between fingers 72 and 73 of the line switch interlock.

Simultaneously, through finger No. 1 of the master controller the current passes to the reverser and momentarily through one of its coils and to *B*-minus over wires 90 and 9 by way of *M*-1 unit switch interlock and the motor cut-out switch. When the reverser operates, however, the coil is thrown out of the circuit, the current passes from No. 1 wire direct to *R* over the line switch interlock. The path continues to the operating coil of *M*-1 unit switch, closing the switch, and thence to *B*-minus on the motor cut-out switch. A branch from the *R* wire leads over *J* interlock to 13, over *M*2 interlock to 14, by way of the motor cut-out switch to 15, through the operating coil of *JR* switch to 12, thence to 11 by way of the line relay on the switchboard in the cab, and to *B*-minus on the motor cut-out through the circuit-breaker trips.

closes a circuit through finger 7, by way of the motor cut-out switch 71, over *R*3 interlock to 31, over *G* interlock to 32, and thence through *J* operating coil to 12 and to *B*-minus by the path already described. When *J* closes, those switches dependent on current through 17 open as the circuit through this wire is broken at the *J* interlock. Consequently, all the unit switches with the exception of *M*1, *J* and *S* open. The closing of *J*, however, connects wire 33 with *B* plus through 16 and *L*. Current through 33 passes by way of *JR* interlock and wire 34 to the motor cut-out switch. Here it divides to pass through wires 35 and 36 operating *M*2 and *G* unit switches. When *G* closes, the circuit through *J* is broken. The opening of this latter switch restores the former connections through 17 and *R*, and the resistance unit switches are closed in the same order as before. The closing of these switches throws the motors in full multiple.

The current, picking up all of the resistance switches,

passes to L through contacts on the limit switch on the cab switchboard. When an amount of current beyond a predetermined limit passes through No. 1 motor, this contact is broken and the progressive picking up of the switches is stopped until the current through No. 1 motor decreases. Wires R and 13, holding the resistance switches after they are once up, however, are not affected by the operation of the limit switch, and consequently the switches already closed retain their position.

When the line switch is closed, the return circuit from all of the switch magnets with the exception of $M1$ switch passes through the line relay on the cab switchboard. The pick-up coil closing the circuit across the line relay is connected in series with resistance tubes which may be observed near the bottom of the switchboard across the 600-volt circuit, the tap for the magnet being taken off on the car side of the line switch. Should the current be cut off the line for any reason, the plunger of the line relay magnet drops, the battery circuit is opened through wire 12, and all the unit switches with the exception of $M1$ open. They cannot again be closed while the line switch is in until the line current is resumed. This arrangement prevents the motors being held across the line and subjecting them to damage that would result with a sudden resumption of the line current after the car has lost its speed.

When the line switch is open, however, an interlock on this bridges across the line relay, permitting the controller to be operated with the line current off. This allows the motors to be used as emergency brakes irrespective of the condition of the line current.

The magnets operating the circuit-breaker trips located on the ends of the switch group are in series with No. 1 and No. 2 motors, respectively. They are so placed in order that excessive current through either of the motors will operate them. When either is opened, the return circuit from the line switch, as well as from all those unit switches dependent on wire 12, is broken, and these switches drop.

Before the line switch can be closed again, the master controller must be returned to the coasting position and the circuit-breaker reset switch already mentioned must then be pressed down for an instant. When contact is made across the reset switch, current passes through wire 7 to the motor cut-out, continuing through 70 to 72 on the $M1$ interlock and thence through one of the coils of the line switch to B-minus on wire 9. When the line switch closes, contact is made across an interlock and part of the current is shunted around the line switch coil by wire 73 through the two circuit-breaker reset coils in multiple, closing whichever circuit-breaker trip has previously opened.

Wire 7 is also used when the master controller is thrown to the multiple position. Only one of the two diverging paths of 7 from the motor cut-out, over wires 70 and 71 respectively, can be used at one time, the path through the line switch being continuous only when $M1$ switch is open, and the other only when $R3$ is closed, and this latter switch cannot be closed when $M1$ is open.

Only wires of the battery circuit reach the motor cut-out switch. The operation of this switch simply breaks the connections to those unit switches not required to be closed for the operation of one or the other motor. When the switch is thrown to cut out No. 1 motor, the return to B-minus of wire 8 is broken and $M1$ unit switch is prevented from closing. At the same time wire R is connected to wire 35, leading to $M2$ magnet, closing this unit switch on the second notch of the master controller. Connections through wires 15, 36 and 71 are also broken, preventing switches JR, G and J closing. With the master controller in full multiple, then, all the switches are closed with the exception of $M1$, JR, G and J.

Throwing the cut-out switch from the "No. 1 out" to the "No. 2 out" position connects the return wire 8 from the $M1$ interlock to B-minus, wire 35 to $M2$ magnet is disconnected, and 36 operating G is given connection to the magnet operating this switch. With the master controller in the full multiple position, the connections are then such that all the switches with the exception of J, JR and $M2$ are closed.

LIGHTING

The lighting of the car is divided into five independent circuits, for interior illumination, besides a separate circuit at each end controlling the vestibule dome lights and the signal markers. The incandescent headlight is in series with a resistance and independent of all other circuits. Fig. 21 shows clearly the arrangement of the lamp circuits. The headlight is controlled by a separate switch, but the marker and dome lights are so controlled that when the latter are turned out on either end of the car the former are turned on. This is for the accommodation of the motorman, whose vestibule at night must be dark, except for the gage lamp, while the headlight and markers are to be lit only at his end of the car.

The interior of each car is lighted by twenty-six 16-cp in-

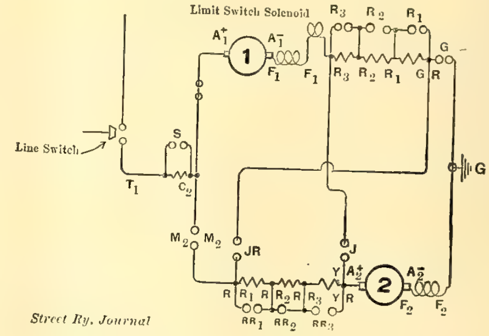


FIG. 20.—MOTOR-CAR CONTROL CIRCUITS

candescent lamps. Two 16-cp lamps are placed in each vestibule in such a manner as to effectively light the platform and the steps. One 16-cp lamp is located in each marker, and a 50-cp lamp is placed in the headlights which are permanently fixed on the vestibule roof between the markers. Snap switches are placed within easy reach of the motorman for the control of the headlight, the markers and the platform lights. All other lights and heater switches and fuses are located on the switchboard.

HEATERS

The cars are heated throughout with electric heaters of the panel type, each having a ventilated sheet-iron back and being placed under the seats. There are twenty-four heaters in the body of the car, and at each end there is one of a special type in the motorman's cab. The heaters inside of the body of the car are proportioned so that each can radiate the heat generated by 600 watts without sufficient rise of temperature to endanger passengers' clothing. The variation in the amount of heat is accomplished by having two sets of heater coils one of twice the capacity of the other. Either or both sets may be cut in by switches, thus providing three degrees of heat, the distribution being uniform in all parts of the car on any step.

The heaters in the steel motor cars were supplied by the Consolidated Car Heating Company, and are of their usual style. Those in the wooden trailer cars were manufactured by the Gold Car Heating & Lighting Company, and are of the truss plank type of construction. The internal arrange-

ment of the Gold heater is of their usual construction, consisting of a special resistance wire wound as a helix and supported on a crimped and enameled steel rod. There are two elements, as in the case of the motor car heaters.

The heating switches are mounted at the top of the switchboard panel at the end of the car.

WIRING

All wires and cables, for whatever purpose, are run in iron conduits. The sizes of wire used in the car wiring were No. 12 and No. 14 for the auxiliary control, and No. 0, No. 00, 144,000 cm and 250,000 cm for the main motor-control circuit. These various sizes of conductor are all made up in standard cable. The stranding and insulation of the various sizes are in accordance with the following table:

B. & S. Gage.	No. of Wires.	Thickness of Rubber Wall.
14	7	4/64 inches.
12	7	4/64 "
0	19	6/64 "
00	37	6/64 "
144,000 circ. mils	450	6/64 "
250,000 circ. mils	61	6/64 "

The insulation of the 12 and 14 wires was laid over a single loose wrapping of fine cotton, and on the larger sizes was laid over one layer of thin paper tape, spirally wound, then the required thickness of rubber, outside of this one layer of saturated cotton tape, wound spirally, and finally two layers of cotton braid made flame-proof. The double cotton braiding on the No. 12 and 14 wires was weatherproof. The rubber insulation was specified to contain not less than 30 per cent of fine Para rubber.

The rubber insulation was tested to show an insulation resistance of not less than 500 megohms per mile after forty-eight hours immersed in water at 70 degs. F. The wires also withstood a puncture test of 3000 volts alternating current at 25 cycles per second on the 4-64-in. rubber wall, and 5000 volts at 25 cycles per second on the 6-64-in. rubber wall.

The No. 12 and 14 wire was used for the auxiliary control. The No. 00 wire was used for the main connections between the line switch, reverser and group switches, and between the third-rail shoes and the bus line. The 144,000-cm cable was used for connection between car body and trailer truck, and for truck and contact shoe connection, and the 250,000-circ. mil cables were used for the bus line. The leads to motors and third-rail shoes from the car body were covered with a coil of spring brass wire for armor, and carefully cleated to the motors and truck bolster to avoid chafing and to reduce their motion to a minimum.

In the vestibule at the motor end of the car is mounted the switchboard (Fig. 22), to which frequent reference has been made. A compartment is provided in the end bulkhead with a metal door lined with asbestos material, which, when

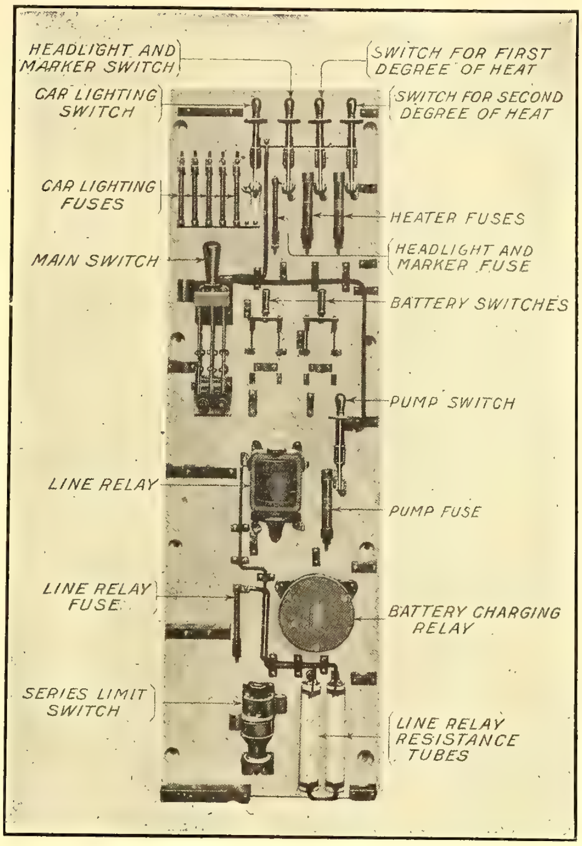


FIG. 22.—SWITCHBOARD ON MOTOR CAR

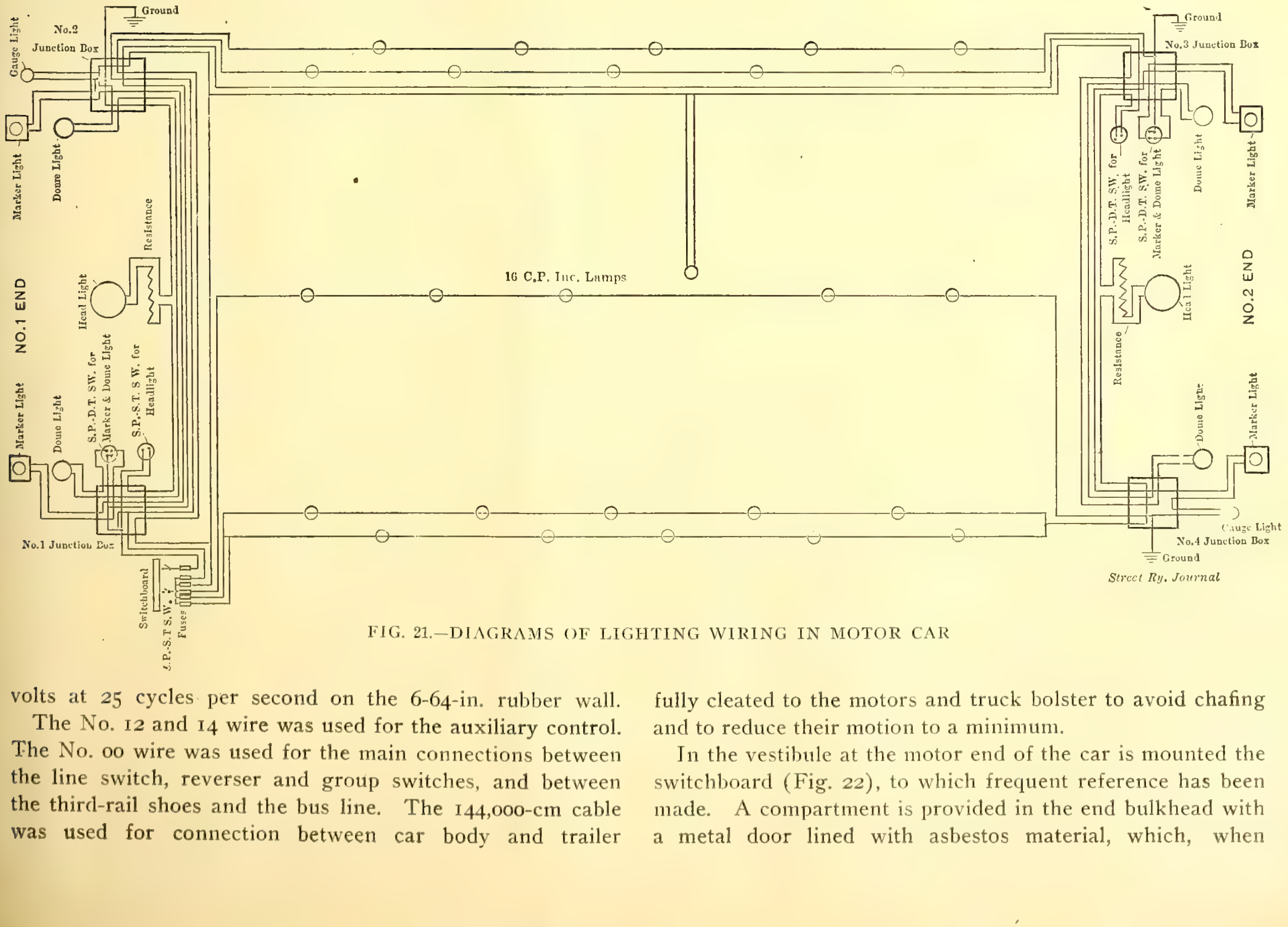


FIG. 21.—DIAGRAMS OF LIGHTING WIRING IN MOTOR CAR

opened, exposes the entire front of the switchboard panel. The panel is supported by a steel frame, being held in it against a rubber cushion, and arc shields of asbestos are provided at all points where arcing from the switches is liable to reach the framework of the car. Additional insulation is provided in the form of electrobestos at the sides and top of the switchboard compartment. The power cables are brought into the bottom of the switchboard through loricated conduit, the ends of which are capped with special bell-mouthed castings fitted with rubber rings to prevent damaging the insulation on the cables.

The conduits are of the "loricated" type, and are run through the framing of the car according to a well-worked-out plan which is uniform for all cars, the framing being drilled at the proper points before the cars left the builder's shops. To aid in this work, a steel subway car was temporarily secured through the courtesy of the Interborough Rapid Transit Company, and upon it the various details of assembling the electro-pneumatic control and the air-brake equipment were so perfected that a standard system of parts, attachments and drillings was determined upon which simplified and hastened the work of installing the equipments upon all cars. A temporary plant was placed in operation at the Locust Avenue shops of the Long Island Railroad, fitted with all the necessary tools for manipaulting the iron conduit, and the work after being started at this shop proceeded with great rapidity until the entire number of 130 steel cars was completely equipped. The motors and all the equipment pertaining to the cars, except the air brakes, were mounted upon them at these shops.

All the switches except the headlight, marker and platform light switches, which are installed in the platform hoods, are mounted upon this switchboard, as well as certain other parts of the auxiliary control system which have been mentioned in various parts of the preceding description.

TABLE OF WEIGHTS

In the following table are given the weights of the principal elements of a steel motor car and its equipment:

Body	31,377
Draw-bars	988
Foundation air brakes	1,165.5
Brake, pipes and fittings	520
Brake schedule parts (including compressor)	2,383.5
Door operating device	340
Supports for electrical apparatus	438
Curtains	99
Seats	844
Motor truck, with gears and third-rail shoes	14,129
Two Westinghouse No. 113 motors	14,430
Trailer truck with third-rail shoes	9,719
Electrical apparatus and conduit	4,857
Lights, heaters, flexible conduit and wire mouldings	848
	82,138
Maximum passenger load, estimated	16,000
Total	98,138

AUXILIARY EQUIPMENT

The steel cars as thus constructed and equipped have now been in successful operation for over a year.

Besides the steel cars above described, fifty-five wooden trailer cars, which had been built six or seven years previously with a view of using them in electrical trains, were equipped to run in trains with the motor cars; provisions had been made in designing these car bodies for conveniently disposing the electric lighting circuits, but the class of work then in use was not considered safe now. These trailers are 46 ft. long and 8½ ft. wide, over all. A view of one of these trailers is given in Fig. 23.

These wooden trailers had formerly been used in certain Long Island Railroad trains that had been run on the Brooklyn Elevated Lines between Flatbush Avenue Station and the Brooklyn Bridge. They have open platforms, side doors and cross seats, and seat fifty-six people. They were wired for electric lighting and heater circuits, and fitted with bus line and train line connections. The lighting and heater circuits

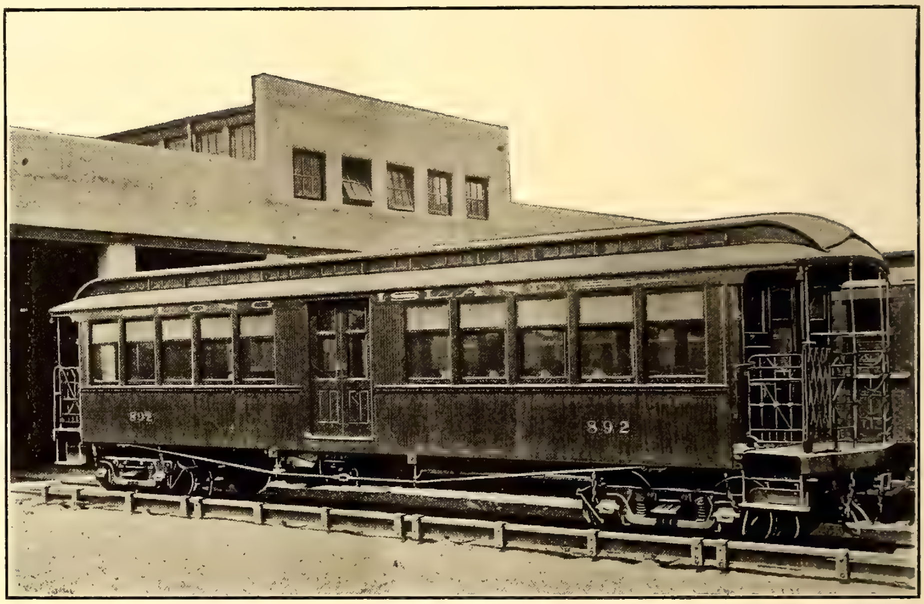


FIG. 23.—VIEW OF WOODEN TRAILER CAR

are supplied by a connection tapped from the bus line through a fuse, and leading to a small switchboard panel from which the distribution is made. There are thirty 16-cp lamps in each trailer.

Five electric express cars were provided, equipped with the standard type of motor and trailer trucks, two 200-hp standard motors, and with the standard multiple-unit control apparatus. These cars are built of wood, 52 ft. 5 ins. over all in length, 9 ft. 9½ ins. in width, and with roof 12 ft. 6¾ ins. above the top of the rails. They are equipped with standard M. C. B. couplers, and haul the old standard steam baggage and express cars as trailers. The weight of these baggage cars is about 76,500 lbs. without load. A view of the completed car is given in Fig. 24.

A rotary snow plow has also been provided, built by the Peckham Manufacturing Company, and equipped with one motor and one trailer truck of standard type, and all of the standard motor car electrical equipment. A set of revolving blades with fan and housings is mounted at each end of the car, operated by one line shaft running through the car and fitted with two friction clutches, one for each end section, the center section carrying two 50-hp railway type motors, run by a series parallel controller of the standard platform type. A view of the plow is given in Fig. 25.

In order that all the electric car equipment might be given a thorough service test, and the apparatus properly adjusted before going into the regular passenger service, the section of the line known as the Old South Road, between Jamaica

and Springfield Junction, was equipped with third rail and all the car electrical equipments were subjected to service running tests in trains of various lengths, and given a continual inspection to insure that all apparatus was in proper order.

These tests also served the purpose of instructing the mo-

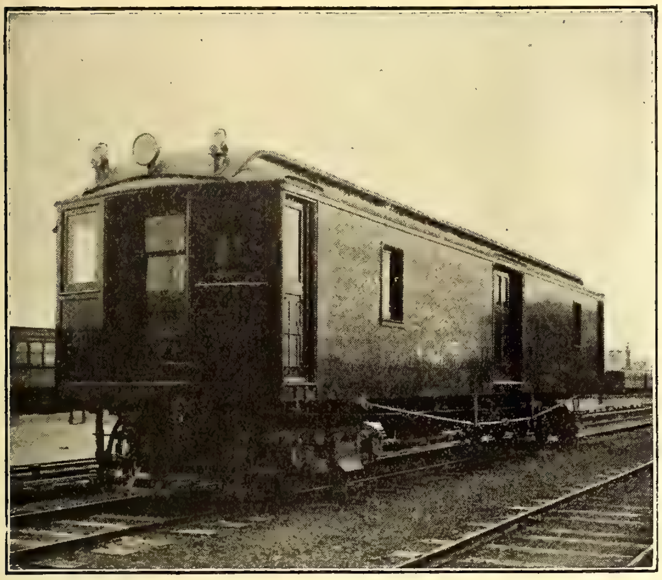
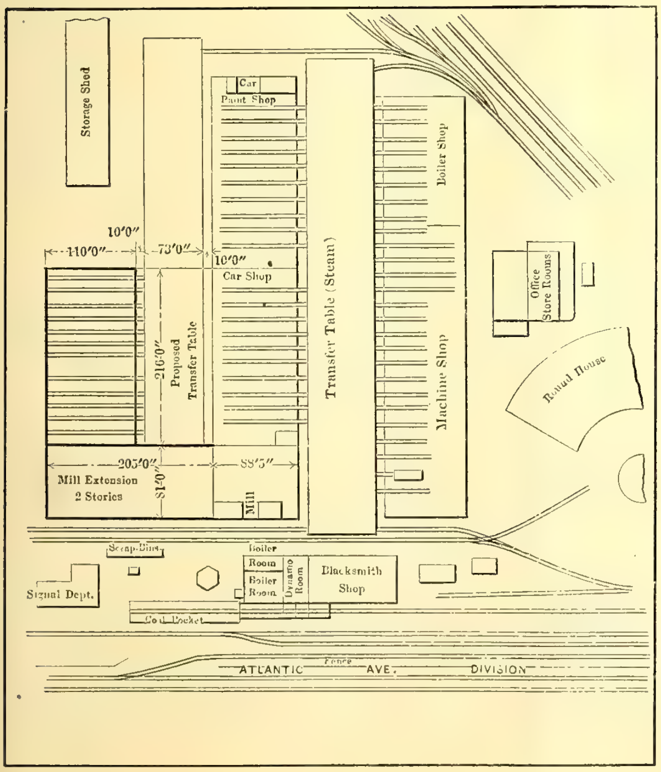


FIG. 24.—VIEW OF ELECTRIC EXPRESS CAR

tormen and familiarizing them with the care and operation of the car equipments and brakes.

CAR SHOPS

The facilities for inspection and repair of electric cars of



Street Ry. Journal

FIG. 26.—LAYOUT OF ELECTRIC CAR REPAIR SHOP AT MORRIS PARK

the Long Island Railroad system consist partly of a section of the original car shop at Morris Park, near Jamaica, which has been to a certain extent remodeled to better accommodate the new motive power, and two inspection sheds, one located at Rockaway Park, at the extremity of the Rockaway Beach Division, the other being at Dunton, which is between Morris Park and Jamaica, on the Atlantic Division. The two latter structures are entirely new and are fitted only for the inspection of trains, while the car shops at Morris Park are fitted with the necessary machine tools for executing repair work.

At Morris Park a new shop was built paralleling the old car shop, and with a transfer table situated between them.

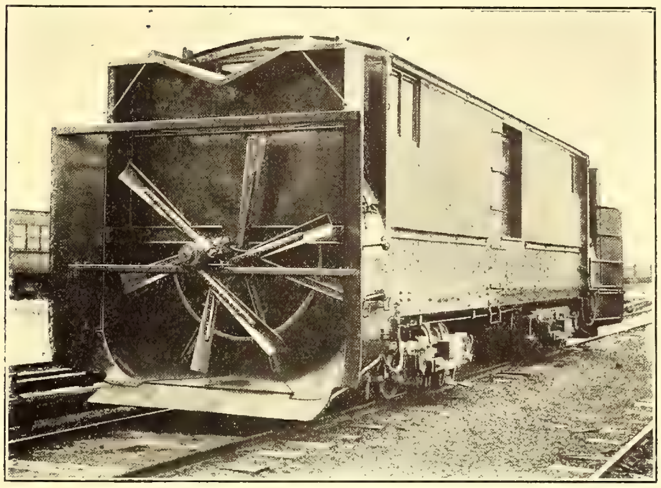


FIG. 25.—ELECTRIC SNOW-PLOW

It is 216 ft. long by 110 ft. wide, and is connected with the mill that runs across the end of the old shop by a two-story structure containing space for pattern, upholstery and brass finishing shops. The walls of the shop are built of brick, and the roof is made in the saw-tooth form commonly used for this purpose. There are thirteen pit tracks, 16 ft. apart between centers. The shop is wide enough to accommodate two 51-foot cars, with a space between the ends of the cars, and 3 ft. between the ends of the cars and walls. The pits are about 26 ins. deep below the top of the rail. A transfer table is 75 ft. wide, and long enough to accommodate the largest type of Pullman coach. The transfer table is operated electrically, and is provided with an electric capstan to assist in moving cars and trucks out of the shops.

Over the two tracks at the south end of the new shop there are light traveling cranes for handling the motors and axles and facilitating general track repairs. These cranes are of about five tons capacity and are hand operated. Hydraulic jacks are used for hoisting the cars.

The original machine shop is already equipped with tools for turning wheels and axles and for pressing wheels and gears upon the axles. The machinery used in the machine shop has since the beginning of electrical operation been operated by three-phase motors receiving current from the Woodhaven Junction sub-station, which is something less than a mile distant. A general plan of the new repair shop, showing its relation with the original plant as maintained for repairing steam equipment, is shown in Fig. 26.

INSPECTION SHEDS

Besides the repair shop facilities at Morris Park, two inspection sheds have also been provided for effecting the periodical inspection and light repairs that are required to keep the cars in fit operative condition. The smaller of the inspection sheds is adjacent to the Rockaway Park Terminal. The walls of this building are of brick, resting on concrete foundations which are carried about 4½ feet above grade, or to the level of the window sills. The roof is 4½-in. concrete slab supported on steel trusses spaced 10 ft. apart. The length of

the building is 242 ft. The extreme width is 49 ft. over the main portion. There is an addition which includes a machine shop, storehouse and office, which is 61 ft. 4 ins. x 20 ft., situated at the northwest corner of the building. The side walls are carried up into a parapet above the roof level, the roof pitching uniformly toward one side of the building for the entire length, the gutters being on the inside of the parapet. The building accommodates three tracks which run completely through it with doors at each end. The doorways have a span of 12 ft. in the clear, and a height of 15 ft. 7 ins. above the rail. The doorways at each end are closed by rolling steel doors. The parapet of the building is protected with a glazed tile coping. Ample light is furnished to the interior by a double row of windows along each side, but skylights are omitted. An exterior view of the sheds as viewed from the east end is shown in Fig. 27. The three tracks are provided with concrete-lined pits throughout their entire length. The rails rest upon 12-in. x 12-in. stringers, the base of the rail being about 4½ ins. above the floor. The floor is of concrete, 7½ ins. thick over the entire interior.

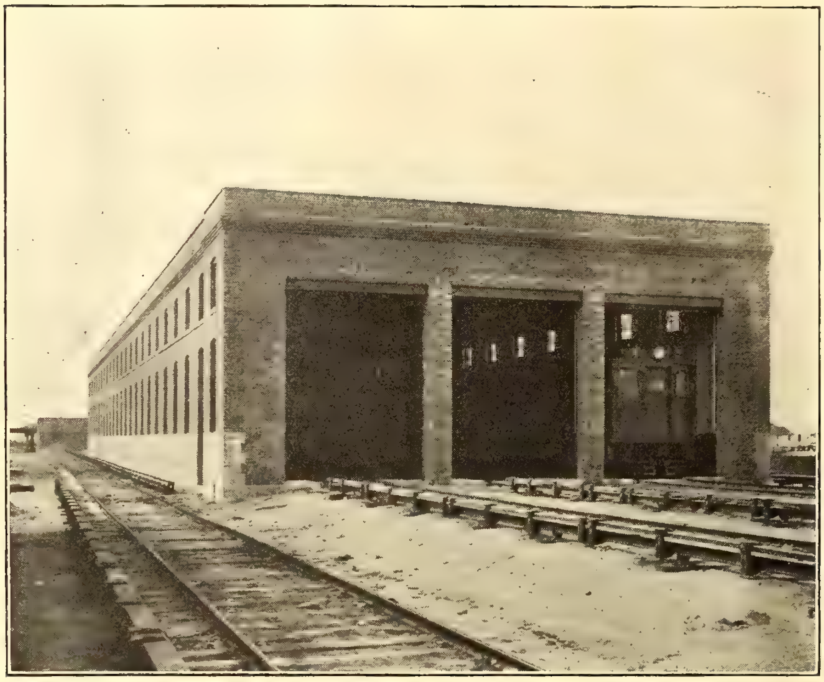


FIG. 27.—EXTERIOR OF ROCKAWAY PARK INSPECTION SHED

The larger inspection shed is located at Dunton on the Jamaica Division, directly west of Jamaica. This building is about double the size of the former, being designed to afford inspection facilities for all the cars on the Atlantic Division, which is a busy line all the year around. The building is constructed entirely of reinforced concrete, with roof trusses of steel plate girders supported in the center of the building on lattice columns. The building consists of one central and two side sections, the central section extending above these, forming a broad clere story with wide windows. The building is 242 ft. 8 ins. in length over all, and 94 ft. wide in extreme width. The steel girders and columns are placed in extreme width. The steel girders and columns are placed in bents 12 ft. apart; the roof of the side section of the building slopes toward the center, while the roof over the central portion is pitched slightly toward either side. The roofing over the whole building is composed of 5¼-in. reinforced concrete slab, covered with five-ply pitch felt and gravel roofing. The gutters along the eaves of the clere story are of 16-ounce copper, while the counter-flashing between the roof and the side sections of the parapet, which runs completely around the building, is of 14-ounce copper, tacked to a 2-in. x 4-in. wooden strip. The plate girders of the side section are 3 ft. 8 in. in depth at their outer ends, and about 2 ft. 4 in. in depth where they rest upon the columns for supporting the clere story. The six tracks run completely through the building, the doorways being fitted with rolling steel doors. The door lintels are each of two 10-in. I-beams.

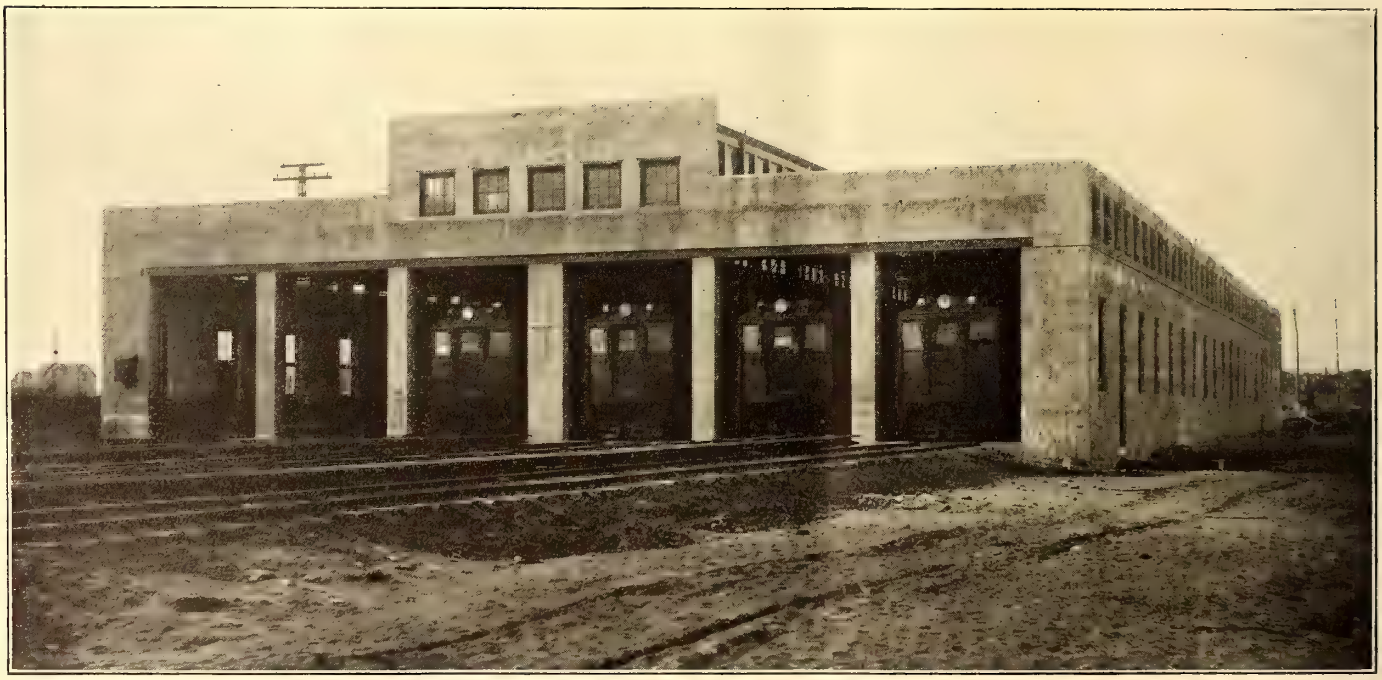


FIG. 28.—EXTERIOR OF DUNTON INSPECTION SHED

The tracks are all provided with pits 3 ft. in depth below the base of the rails, which set about 4½ ins. above the floor

level upon 12-in. x 12-in. wooden stringers. A view of the exterior is shown in Fig. 28, and one of the interior is given in Fig. 29.

The Rockaway Park inspection shed will accommodate twelve cars, and that at Dunton twenty-four. The latter station is provided with room for an office upon a gallery running across one end of the building, reached by an iron staircase coming up between the tracks.

The Dunton inspection shed was built on rather uneven ground, and at one end of it is provided a heating plant, set in a basement which is finished off under one corner of the structure, covering an area of about 34 ft. x 37 ft. x 35 ft. The nature of the ground enabled the construction of this basement without the necessity of excavating, and provided a very convenient location for the heating plant and fuel. Coal can be dumped into this basement through suitable openings placed between the tracks directly over it. Construction details are shown in Fig. 30.

The Dunton inspection shed is equipped with lavatory conveniences. At Rockaway Park the lavatory is situated in the terminal station adjacent.

Both sheds are fitted with electric lighting, the wires being run in iron conduit and receiving current from the third rail. There are 330 lamps in the Dunton shed and 220 at Rockaway Park. Sockets are also provided for enabling temporary connections to be made to the third-rail shoes, so that cars can be moved up and down the tracks, there being no third rail inside the building. A 4-in. fire line with hydrants is also provided at each of the inspection sheds.

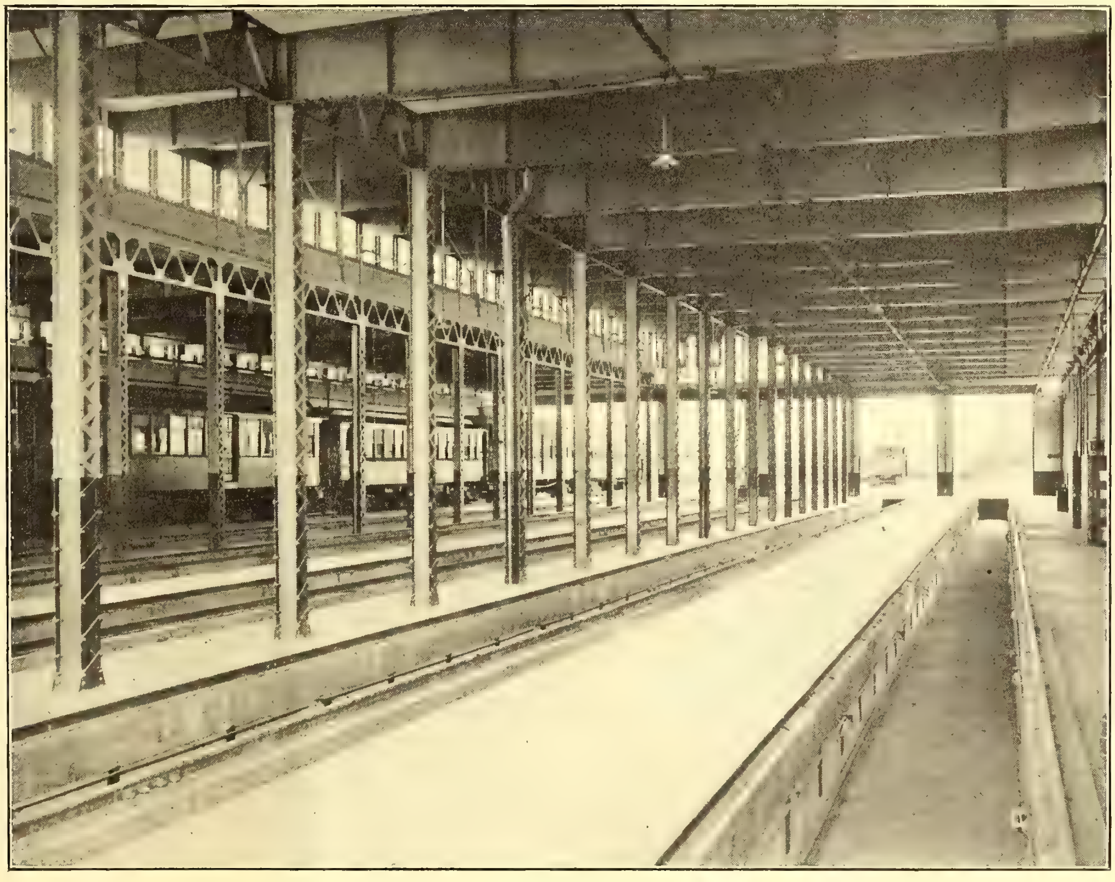


FIG. 29.—INTERIOR OF DUNTON INSPECTION SHED

ORGANIZATION

The equipment of the steel passenger cars, the auxiliary rolling stock, and the building of inspection sheds were carried out by Westinghouse, Church, Kerr & Co., who, as in the other portions of the complete equipment, acted as constructing engineers.

The entire work of design and construction was in charge of George Gibbs, chief engineer of electric traction of the Long Island Railroad.

CONCLUSION

With the preceding account of the electric car equipment, the description of the newly installed system for operating the Long Island Railroad trains with electric power is brought to a close. The car equipment has proved itself in every way equal to the demands made upon it both for regular and emergency conditions of travel. The electro-pneumatic multiple-unit control system has worked perfectly from the start, and throughout the entire installation, including the power station, transmission system, sub-stations and cars, the endeavor was made not only to take advantage of the most recent progress, but, as opportunity offered, to establish new precedents in the art. In achieving the distinction of being the first one of the main steam railroad lines to initiate and make effective the change of motive power for its suburban service to meet the needs of its territory, the Long Island Railroad Company has set an example of foresight, thoroughness and sufficiency in the execution of the undertaking.

The contract with the American Car & Foundry Company for the steel car bodies was let on Jan. 20, 1905. The first car body was received at the Locust Avenue shops for equipment early in April, 1905, and another one was exhibited at the International Railway Congress in Washington early in May. By Aug. 16 the entire number of steel cars had been delivered at the shops, where they were mounted upon trucks and all parts of the electrical equipment assembled. During the summer the cars were equipped at the rate of ten per week. The first test of a completely equipped car was made on May 13, 1905. A month later, fully equipped trains were running on the branch between Jamaica and Springfield for testing the equipment and for the instruction of the motormen. Regular electrical operation was first inaugurated between Flatbush Avenue and Rockaway Park on July 26, 1905. Service between Flatbush Avenue and Rockaway Junction was inaugurated on Aug. 30. In October, the heavy excursion traffic to and from the Belmont Park Race Track was successfully handled. On Dec. 11 the electric service was extended to Far Rockaway and Valley Stream, and the use of steam locomotives for hauling passenger trains to and from the Brooklyn terminal of the Long Island Railroad was discontinued.

On April 27, 1896, the act creating the Atlantic Avenue

Commission passed the New York State Legislature, this being the formal beginning of the working out of a transportation problem that was of immediate and far-reaching importance to the citizens of Brooklyn and the Long Island Railroad. Several years elapsed before the results of the work, first of the Commission and then of the Board of the Atlantic Avenue Improvement, began to be noticeable, but it progressed year by year until finally consummated on the above date, a little less than ten years from its inception.

The respective parts taken, first, by the Atlantic Avenue Commission in formulating a concrete plan of improvement of such far-reaching importance; and later by the Board of the Atlantic Avenue Improvement in planning and executing the work; and by the Long Island Railroad in co-operating with all the duly constituted authorities for the advancement of a plan so conducive to the welfare of the community served by it, have not been enlarged upon in the foregoing technical description of the work, but they are now matters of history,

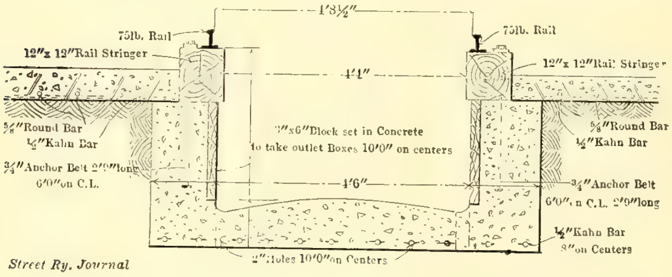


FIG. 30.—DETAILS OF PIT IN SIX-TRACK INSPECTION SHED AT DUNTON

a full knowledge of which is available for other municipalities and corporations which may be confronted by similar problems.

But the record will be incomplete without an acknowledgment of the credit due to the late William H. Baldwin, Jr., president of the Long Island Railroad from 1896 to 1905, whose foresight, public spirit and initiative played such a leading part in the solution of a difficult rapid-transit problem. Could he have lived but one year longer, he would have witnessed the consummation of his labors, which have conferred a lasting benefit on the community.

DATA REQUESTED BY THE AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION'S COMMITTEE ON A STANDARD CODE OF RULES

The American Street & Interurban Railway Association's committee on a standard code of rules is sending out a circular letter to the general managers of the street and interurban electric railway properties of America, referring to the fact that the committee on standard rules submitted a report to the association at the St. Louis convenion in 1904, in which report was embraced a code of general rules for the government of trainmen of electric roads and also some additional rules, applicable to interurban roads, to be used in connection with those contained in the standard code of rules. The complete report of the committee is contained in the twenty-third (1904-1905) annual report of the association. These rules have also been issued in pamphlet form and sent to the various street railway companies of the country. The committee states that those who have no copy of the rules can secure the same by application to the secretary of the association.

In this letter it is stated that before proceeding further, the committee desires to know if the rules contained in the report which was submitted at St. Louis have been universally adopted, and if not, to ascertain the reasons for their non-use.

Replies to this query should be sent to B. V. Swenson, secretary of the American Street & Interurban Railway Association, 60 Wall Street, New York City. If the rules have not been adopted, the respondents are requested to give the reasons why, and also any other suggestions that will assist the committee in further considering the revision of the report of 1904.

The following is a copy of the data sheet to be used in replying to this inquiry. The results of this investigation will form part of the committee's report to be presented at the Columbus convention in October. As the time is becoming very limited, prompt replies are desired.

American Street & Interurban Railway Association
60 Wall Street, New York
Office of the Secretary
Committee on Standard Rules

Data Sheet No. 11. August, 1906.

(1) Company ....

(2) City .... (3) State ....

(4) Urban or interurban system..........

(5) Have you adopted the Standard Code of Rules as submitted by the committee at the annual meeting of the association at St. Louis in 1904? ....

(6) If not, please state your reasons for not adopting these rules..........

(7) Please offer suggestions applicable to the rules (seriatim)..........

(8) High-speed interurban service. (a) Do you consider it desirable that the committee formulate a special code of rules for high-speed interurban service? ....

(b) If so, kindly offer suggestions on a separate sheet.

Rule Book. If you are using a Rule Book other than that of the association, will you kindly send us a copy?

Remarks. Kindly put additional data and suggestions on a separate sheet and attach it to the data sheet.

Signed ....

Title ....

Notice.—This information blank is sent you in duplicate form. Please fill in the information asked for at your earliest convenience and return one copy to Bernard V. Swenson, secretary American Street & Interurban Railway Association, 60 Wall Street, New York City. The results of this investigation will form a part of the convention report of the committee on standard rules.

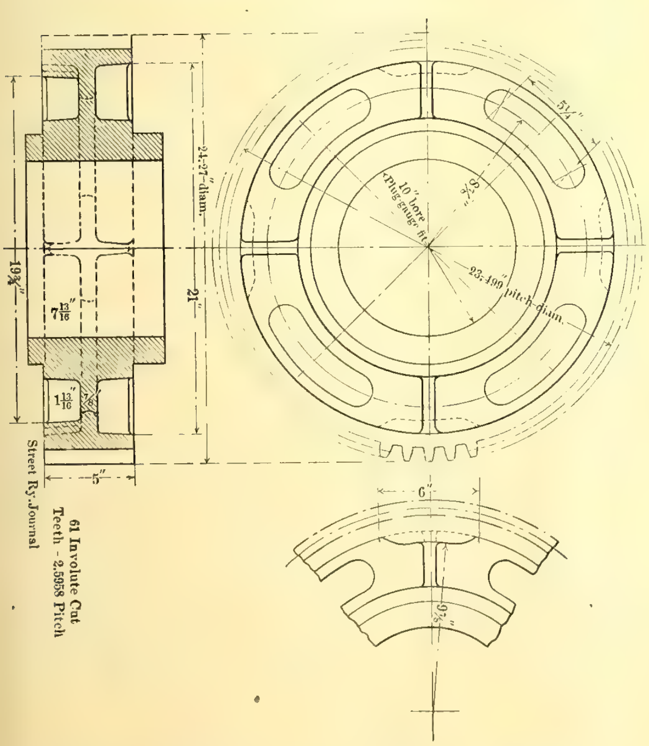
The above-mentioned letter is signed by the following members of the committee on standard code of rules: E. G. Connette, chairman; E. C. Faber and E. J. Ryon.

The seven interurban roads radiating from Toledo have arranged for a joint baggage room, located in a building directly opposite the present Union passenger station on Superior Street. All baggage intended to be transferred or for local delivery will be handled from this station. Baggage will be checked to all points to which interline tickets are sold, including Indianapolis, Ft. Wayne, Dayton, Mt. Clemens and Port Huron. Heretofore, baggage has gone to the interurban freight station on Huron Street, which is some distance from the passenger station, and, as there were no arrangements for transferring baggage, passengers lost connections by having to attend to this matter themselves. The joint baggage room is under the supervision of J. S. Young, representing the Maumee Valley Railway & Light Company, which will be responsible for the baggage department and will pro rate the expense among the various lines. The Toledo Transfer Company has opened an office in the same building.

GEAR PRACTICE ON THE INTERBOROUGH SYSTEM

In the direction of perfecting the various details pertaining to car equipment, the Interborough Rapid Transit Company, of New York City, has been giving considerable attention to the subject of gears. The company has been using extensively a solid cast-steel gear, but it is about to experiment with gears made of other metals. It is the intention to equip several hundred cars with gears of various types, namely, solid manganese steel gears having ground teeth, furnished by Benjamin Atha, of Newark, N. J.; Krupp steel gears with case-hardened rims imported from Germany; gears having cast-steel centers, with wrought-steel rims shrunk on to the centers, and high-grade cast-steel gears. These equipments will be operated under exactly similar conditions for a long enough period to determine the relative life of the different metals.

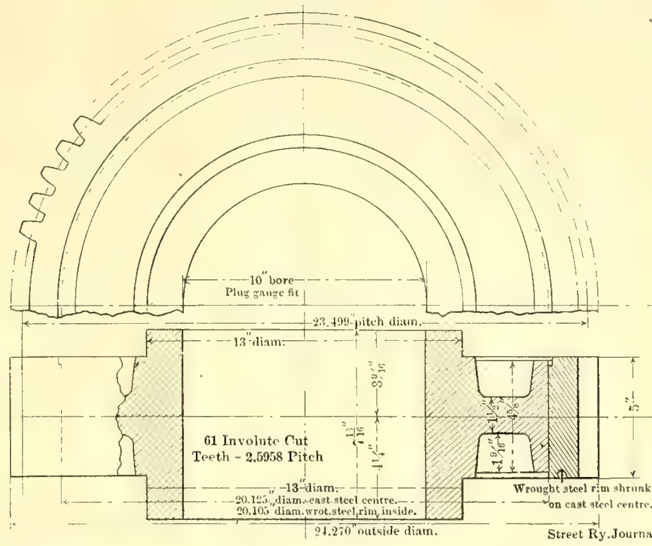
It is interesting to note that, for the purpose of making these and other comparisons, the Interborough is arranging a system with thousand ton-miles as the basis of reference. The present method is to use the straight-mile basis for determining the life of parts, but it is believed the ton-mile basis offers many attractive possibilities in the direction of arriving at conclusions that will be more nearly correct theoretically. The point is made that the ton-mile will provide for the important factor of weight of car and that this method will, therefore, give a much fairer basis of comparison between roads having extremely heavy service, similar to the New York elevated and subway lines. It is also believed this same system of comparison can be applied to lighter conditions, such as are found on the average interurban road, and will give means whereby the results on roads of this class can be studied and compared with far greater satisfaction than with the straight-mileage basis. It will also give a better basis



CAST-STEEL GEAR FOR GE 66 MOTOR, INTERBOROUGH RAPID TRANSIT COMPANY

upon which to compare results with various classes of equipment on the same road. In arriving at the ton-mile unit, it will, of course, be necessary to take the weight of the equipment without passenger load, and while this will not include the passenger-load factor, it will give a better basis for comparison than the car-mile alone.

The accompanying drawings show the solid cast-steel gear now in use and also the proposed cast-steel center gear with



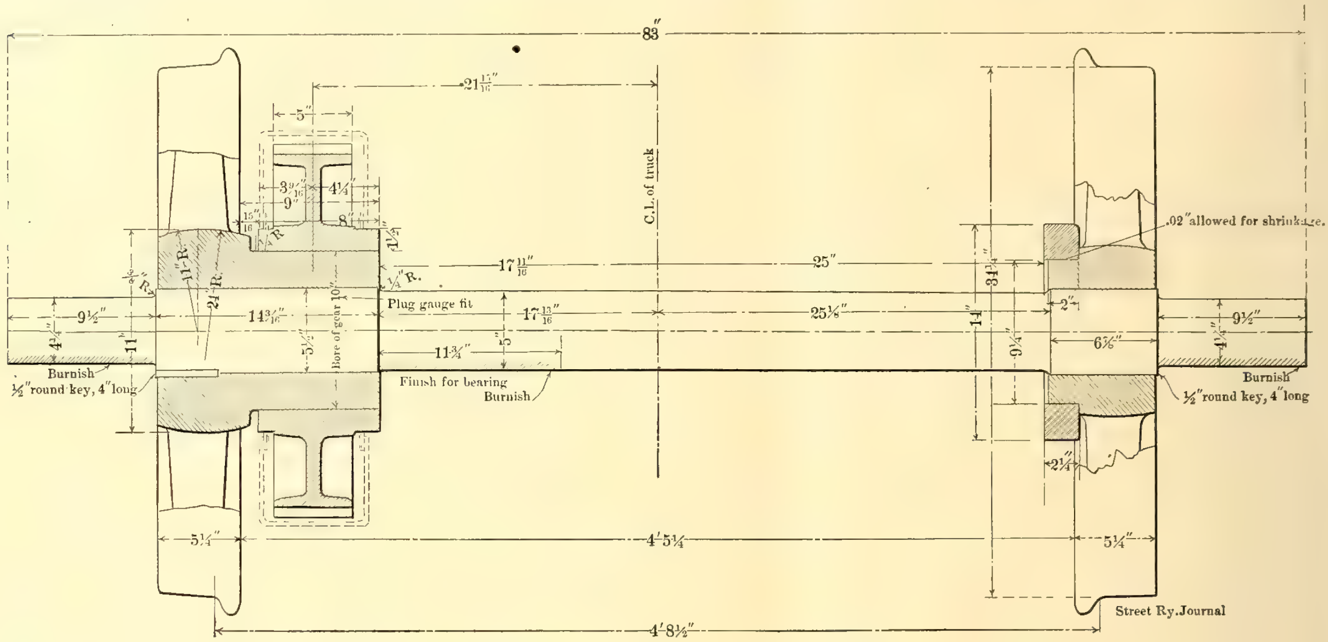
GEAR WITH WROUGHT-STEEL RIM SHRUNK ON CAST-STEEL CENTER FOR GE 66 MOTOR, INTERBOROUGH RAPID TRANSIT COMPANY

wrought-steel rim. The latter form will, of course, be more expensive in first cost, but it is believed that many of the same arguments can be urged in favor of a gear with a shrunk rim that have been advanced in favor of the steel-tired wheel. For instance, the steel center of a gear of this type can, with entire justification, be considered as a permanent part of the truck investment, and the cost of maintaining gears will be virtually confined to the cost of renewing the rim. The results that will be secured with the solid manganese and the Krupp case-hardened gear are still problematical, but confidence is expressed that these harder metals will give a good account of themselves in the application to the making of gears for extra heavy service. The company has had in use samples of gears made of solid cast manganese steel, with ground teeth, and these have already run 20,000 miles on the Manhattan Elevated division without showing perceptible signs of wear. It is evident that the justification for the material increase in first investment for gears made of these harder metals must be found in the saving in cost per thousand miles, or per thousand ton-miles, and in the reduced accident hazard, but whether the results will bear out the expectations is a matter that can be demonstrated only by actual trial.

In this connection it is in order to describe the method of applying the gear. The system followed is not new, as it was suggested originally by Messrs. Doyle and Brinkerhoff for use on the Metropolitan West Side Elevated Railway of Chicago as early as 1897, and it was also described in the Street Railway Journal for Dec. 6, 1902. But the results that are being secured with the method on the Manhattan elevated railway are worthy of comment. Briefly described, the idea is to provide the wheel on the gear end of the axle with an elongated hub, for the purpose of furnishing a seat for the gear. The extended hub is an integral part of the wheel, and in the Interborough standard measures 14 3-16 ins., finished, from end to end. The gear is shrunk on to the seat provided by the extended hub, according to the M. C. B. specifications for shrinking operations of this nature. That is, the inside bore of the gear is one one-thousandth of an inch smaller for each inch of diameter than the seat to which it is shrunk. This practice of shrinking the gear into place on the hub of the wheel not only eliminates all bolts

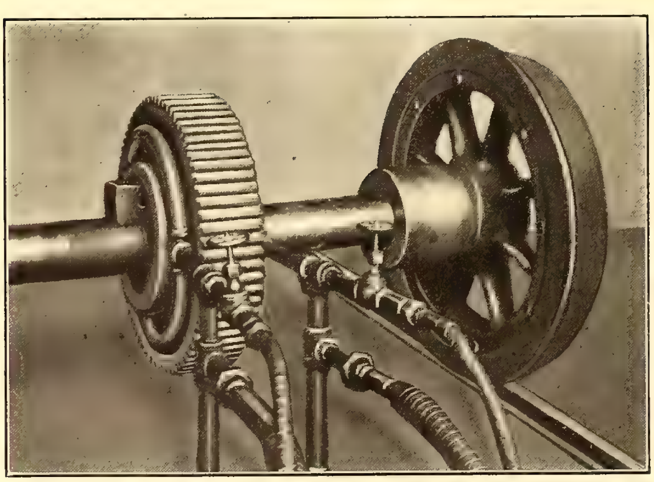
and danger of the gear becoming loose, but also gives the very great advantages of strengthening the axle at the point of greatest strain, and insuring an absolute fit between the wheel and the axle. As a matter of fact, the statement is made that where the practice has been followed on the Interborough equipment there has never been an instance of a wheel becoming loose in service. This statement is all the

As will be noted from the engraving, this practice has eliminated the necessity for cutting a long key-way in the axle, and thus avoids introducing what is commonly a serious weakness in the axle at this point. The method followed on the Interborough, where the extended wheel hub is used with the shrunk gear, is to key the wheel to the axle by means of a single round key, ½ in. in diameter and 4 ins. long. After the



AXLE AND WHEELS ON MOTOR TRUCKS, MANHATTAN DIVISION, INTERBOROUGH RAPID TRANSIT COMPANY, SHOWING METHOD OF SECURING GOOD WHEEL FIT BY SHRINKING GEAR ONTO EXTENDED WHEEL HUB ON ONE WHEEL, AND BY SHRINKING STEEL RING AROUND HUB OF OTHER WHEEL

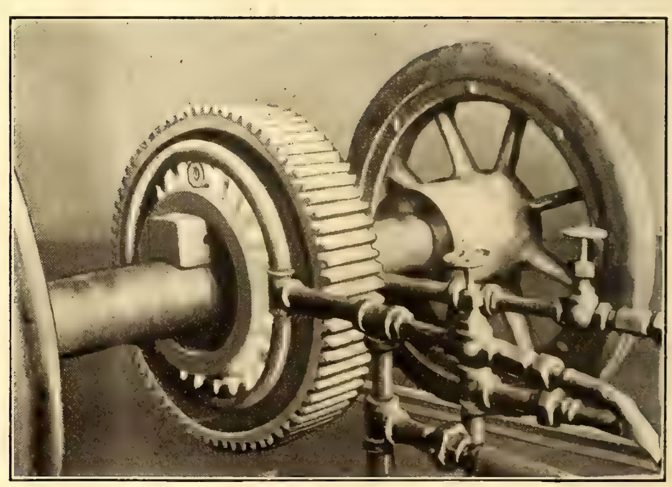
more forcible when it is considered that the same results are secured with wheels that have been pressed off and on several times. The M. C. B. rules do not permit, under usual conditions, the practice of pressing the wheel back on to the same axle seat more than twice. But by shrinking the gear on to the hub, as outlined, the objections of the M. C. B. authorities are entirely overcome, because it has been found that by shrinking the gear over the hub, a tighter fit is secured between the wheel and the axle than is obtained when a wheel is pressed on in the first instance under the M. C. B. requirements. During a recent test it was demonstrated that a wheel that could be pressed off the axle with 25-tons pressure without the reinforcing gear could not be moved on the axle seat with 85-tons pressure after the gear had been shrunk in place.



ARRANGEMENT FOR HEATING GEAR PRIOR TO SHRINKING ONTO WHEEL HUB

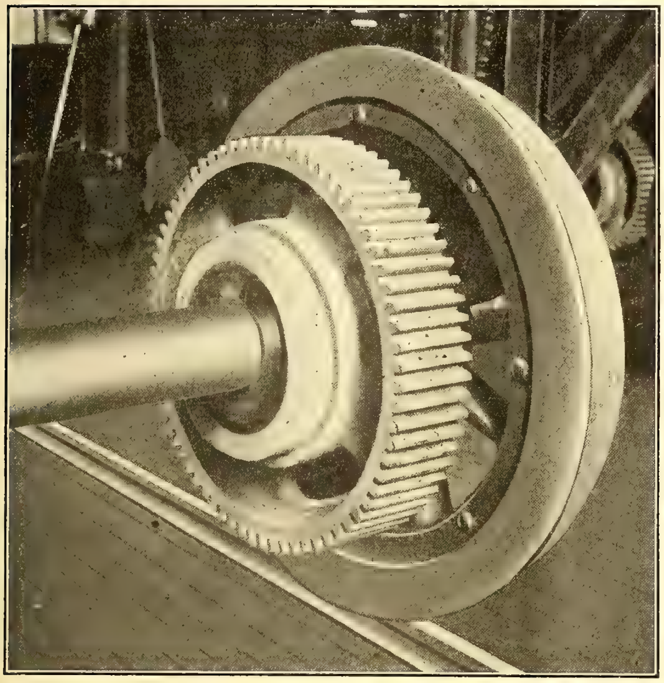
wheel is in place on the axle seat, the key hole is drilled from the outside to the proper depth, and the round steel key is then driven to a tight fit.

The operation of heating the gear in order to shrink it on to the hub is as follows: The gear is slipped onto the axle before the wheel is pressed on, and during the heating process is held loosely and clear of the axle by means of a special shaped metal block designed to fit between the inside of the gear hub and the top of the axle. Two rings of 1-in. gas pipe, which are supported on standards from the car-house floor, are then arranged around and a short distance from the gear hub, one on each side of the gear. The rings of gas pipe have a series of perforations around their inner sides, and are connected to both gas and air supply to give a blow pipe effect. The air



PROCESS OF HEATING GEAR PRIOR TO SHRINKING ONTO EXTENDED WHEEL HUB

supply pipe to the rings is ¾ in. in diameter, and air is furnished at about 80-lbs. pressure. When all is in readiness, the mixture of gas and air is admitted to the rings in proper proportions to give a clean, intense flame, a torch is applied and the blow flame from the perforations in the rings is directed against all sides of the gear hub. As soon as the hub begins to show a faint sign of color, which it does in from 9 minutes to 10 minutes, the heating rings are removed and the gear is shifted over to its seat on the extended wheel hub. It is allowed to air cool, and in cooling the gear hub contracts to a tight fit upon its seat. The pair of wheels are then ready for service, no machine work or other operation being necessary. In removing the gear the process is similar. A shield is interposed between the gear and the wheel to protect the wheel from the heat, and the flames from gas rings are applied to the hub of the gear, causing the hub to expand, and the gear then can be slipped easily from its seat. The accompanying half-tone engravings illustrate the steps in the process.



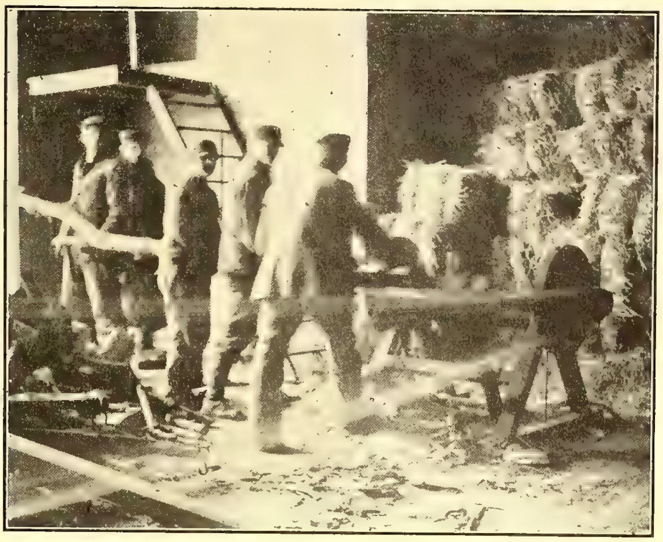
GEAR SHRUNK ONTO SEAT ON EXTENDED WHEEL HUB

Based upon the remarkably satisfactory results secured in binding the wheel to the axle as an incident to shrinking the gear over the wheel hub, the principle is now being applied to the wheel at the opposite end of the axle. As will be noted from the drawing, this is accomplished by finishing off the hub on the inside of the wheel, to give a bearing surface for a cast-steel ring which is shrunk around the hub in about the same manner as the gear is shrunk on to the extended hub on the opposite wheel. The collar is about 2¼ ins. thick and is 9¼ ins. inside diameter, and about two one-hundredths of an inch is allowed for shrinkage between the inside diameter of the ring and the bearing seat on the hub. This ring will perform the service of binding the wheel to the axle and, it is believed, will entirely eliminate the possibility of the wheel working loose.

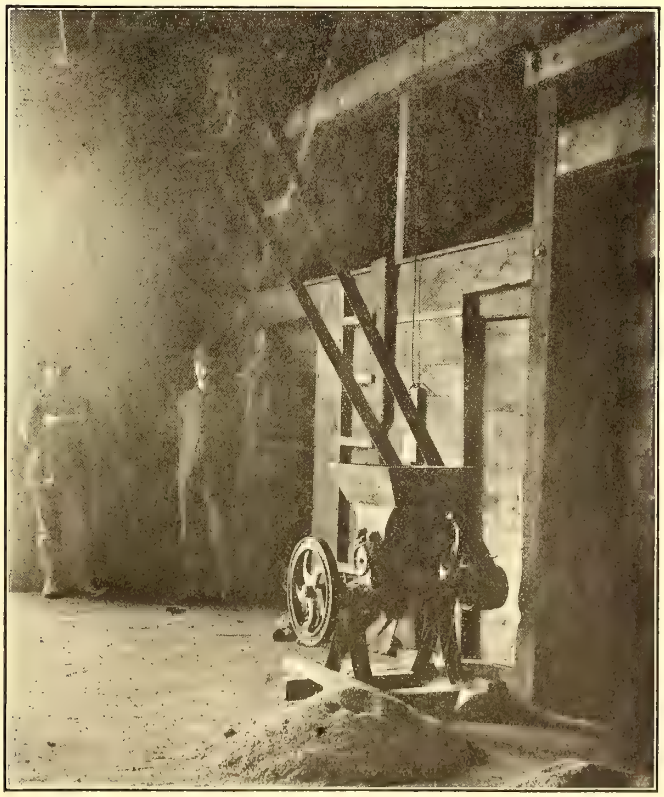
The Strangen-Wick Railway Company, which operates a suburban line near the city of Stockholm, the capital of Sweden, has contracted with the Westinghouse Electric & Manufacturing Company for the electrical equipment of the cars to operate this road with the single-phase system.

MOTORS FOR DRIVING FARM MACHINERY

It frequently happens that the capacity of the generating station of an interurban railroad is large enough to permit of the disposal of a great deal of power if purchasers could be found. Some companies have pushed the sale of power for lighting towns along the right-of-way and for operating motors in these towns, but in a very few instances have attempts been made to supply power to farmers along the line. There is, however, quite a field for the sale of current for this purpose. Windmills are too unreliable for the average farmer and gasoline engines require time in starting them, and considerable care to maintain them. The electric motor is, in fact, the ideal power for the farmer. It is always ready for service, and if not abused or overloaded, there is very little likelihood of it getting out of order. Moreover, the installa-



SAWING WOOD ON A FARM WITH A MOTOR-DRIVEN SAW



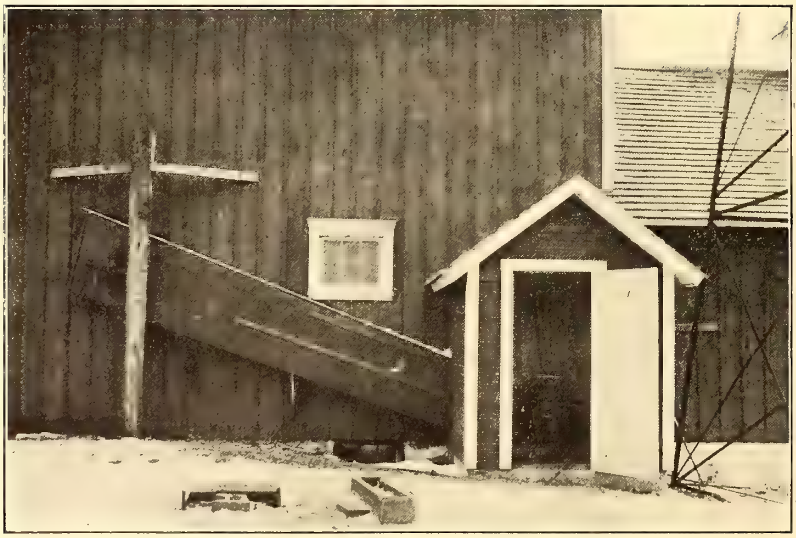
A MOTOR-DRIVEN CORN CRUSHER ON A FARM NEAR ELGIN, ILL.

tion of a motor does not increase the fire risk, and the cost of operation is not excessive.

The accompanying reproductions show some of the installations on farms along the line of the Aurora, Elgin & Chicago Electric Railway. In this instance, the railway simply furnishes the power. The work of installation was done by local electrical contractors. Within five or six miles of Elgin there are about fifteen installations, and others are found scattered along the line. The district around Elgin is noted for its dairy products, and the motors are in most cases employed to drive feed-crushing and grinding machinery. In almost every instance the motor is installed in a detached building, and a chute is provided for protection to the belt, which drives the line shaft in the building in which the machinery is installed. In installing the motors every precaution has been taken to protect them from the weather, and to prevent possible damage to the wiring. The houses covering them are built tight, to avoid the possible entrance of water, and are lined inside with sheet asbestos. A meter is installed in the house with each motor, which is usually of 15-hp capacity. The total cost of installation of a motor is about $600. This includes the cost of erection of the building, the cost of the motor, the expenses of running the line from the tracks of the railway, and the work of installing the wiring and connecting up. The rate charged by the railway company is usually 4 cents per kilowatt. In one instance, the cost of the current used in grinding corn for fifty cows, and sawing wood, etc., was $2 per month. The cost was about one-half cent per bushel for grinding corn.

A CORN SHREDDER AND CRUSHER DRIVEN BY A 15-HP MOTOR

The farmers are all highly pleased with the performance of the motors, as practically no trouble has been experienced with any of them. All the care that the motors have required has been that of oiling them at frequent intervals and renewing the brushes once or twice a year. Power for the motors is taken direct from the trolley and carried on pole lines to the motor house. The advantage to a railway company, having surplus power, of supplying such service can readily be seen, as local firms can be induced to make the installations, and then all the company is required to do is to read the meter and collect the bills.



MOTOR HOUSE IN WHICH A 15-HP MOTOR IS INSTALLED FOR OPERATING FARM MACHINERY

DETACHED MOTOR HOUSE, SHOWING CHUTE IN WHICH THE BELT IS CARRIED TO THE LINE SHAFT IN THE BARN

NEW LIMITED SERVICE BETWEEN TOLEDO AND DETROIT

The Detroit, Monroe & Toledo Short Line has started its new limited service between Toledo and Detroit. There will be four limited trains each way daily making the 60 miles between the interurban station in Toledo and the city hall in Detroit in two hours. The company had built for this service two very fine parlor chair cars, but a trial trip last week demonstrated that the cars were too wide to pass other cars on the city tracks in Toledo. If possible the cars will be altered, and until this is done other cars will be used in the service.

REINFORCED CONCRETE BRIDGES

BY DANIEL B. LUTEN

Bridges of reinforced concrete have many advantages for interurban railways. They compete readily with steel in first cost, and are absolutely permanent, while steel bridges at best endure but twenty or thirty years; concrete bridges, moreover, grow stronger with age, and at a much more rapid rate than the ordinary increase in weight of traffic. Steel and wooden bridges begin to deteriorate from the very day of erection, and railroads have been forced again and again to replace good steel bridges because they have become too light for the heavily increased traffic.

The concrete bridge provides a continuous solid roadbed,

FIG. 1.—A 22-FT. HORSESHOE ARCH ON THE INDIANAPOLIS & WESTERN RAILWAY

so that all conditions of sub-grade, ballast and ties are the same as for the rest of the roadway, and no adjustments of ties to girders, placing of guard rails, etc., are necessary. The steel bridge and wooden bridge, if provided with ballast floor, have these same advantages, but at much greater cost than the reinforced concrete bridge; and the passage of trains over the latter is practically noiseless, while the roar and vibration of the former can not be successfully eliminated.

No delays, such as are exasperatingly frequent in ordinary

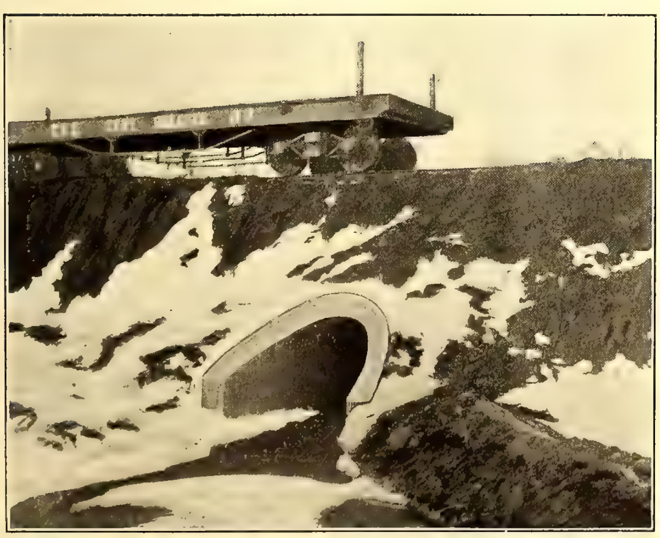


FIG. 3.—HORSESHOE ARCH ON THE INDIANAPOLIS & NORTHWESTERN RAILWAY

steel members, are to be met with in the erection of reinforced concrete bridges, and the concrete bridge offers a better solution than wood for the engineer who has prepared his steel plans too late to secure the steel from mills that are often several months behind their orders. Nearly everything required for the reinforced concrete bridge is procurable in the immediate vicinity of the proposed structure; such a bridge can even be constructed by the railway company's own construction gangs when contractors fail to erect promptly. Concrete bridges are readily made floodproof, and they provide greater discharge capacity for the same waterway area than bridges having a separate superstructure. They are, moreover, less likely to become clogged by debris, are much more readily adapted to skew locations, and can be designed to fit any location for which a steel girder is feasible.

The reinforced concrete bridge is much the safer structure, for it never collapses suddenly, but in case of failure gives abundant warning by cracks and distortion at the reinforced edges long before final failure. The steel bridge almost invariably falls with a crash, with no signal of danger. A slight oversight in the inspection of the steel, the omission or

FIG. 5.—A 50-FT. CONCRETE ARCH ON THE LIMA & TOLEDO RAILWAY

burning of a rivet seriously endangers the steel structure, and the wonder is with so complicated a bridge, requiring such careful workmanship and such close following of the drawings, that more of them have not failed disastrously. One need only inspect a few of our steel highway bridges, which are not usually erected under careful supervision, to learn that eternal vigilance is the price of safety in steel bridges. Numerous instances can be shown where bridges have been erected with rivets that could be turned loosely in their holes,

FIG. 4.—A 20-FT. SPAN ON THE INDIANAPOLIS & NORTHERN LINE

with wind bracing omitted, and even with the counters in the wrong panels. In short, numerous details of a steel bridge may be overlooked and can never be detected save by an expert, until finally the critical load or high wind carries the structure down with no warning of danger to the uninitiated. The average engineer must rely almost entirely on the steel bridge builder for security of erection.

With concrete bridges, cement may be omitted, to be sure, and the reinforcement may be wrongly placed, but if the bridge stands the first test while comparatively new with no signs of failure, the structure will then prove safe for subsequent loadings on account of its rapid increase of strength. Probably the most severe test to which concrete bridges are subjected are when the centers are removed after earth filling has been completed, and usually within thirty days after erection. Even the solidifying of the earth filling over the structure after a few months makes the bridge many times stronger than when first covered with loose earth. The strength of the concrete structure is thus put to the test even before the final payments are due the builder, so that oversights in construction and inspection may be checked before final acceptance. With the steel bridge, on the contrary, only the most careful examination by an expert will disclose these defects, and even then it would require a laboratory test with microscope for each and every member to determine the quality of the steel. In steel bridge construction the reputation of the builder is all important; with concrete bridges, if the efforts of a reputable builder are added to the other safeguards above mentioned, the bridge can hardly prove defective. The concrete bridge shows even to the layman on the removal of the forms whether or not it is to be a success.

One objection is sometimes made to the reinforced concrete bridge, in that most of the methods of reinforcing are patented. But consideration will show that this is an advantage, for it usually gives and should give to the patentee some control over the design, thus insuring expert technical advice, which in any one of the patented systems will work a saving of materials and labor far above its cost.

In appearance the concrete bridge has every advantage over steel and wooden bridges. The latter can not be made beautiful without additional cost. The concrete bridge is inherently beautiful without any additional cost, and every detail may by skillful design be made to add to its beauty without any corresponding increase in cost. The concrete bridge never requires painting or repairs, while steel and wooden bridges always do.

FIG. 7.—OVERHEAD CROSSING ON THE LIMA & TOLEDO RAILWAY

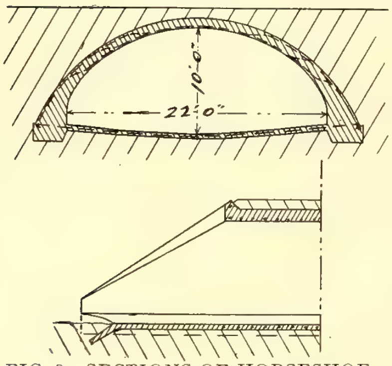


FIG. 2.—SECTIONS OF HORSESHOE ARCH

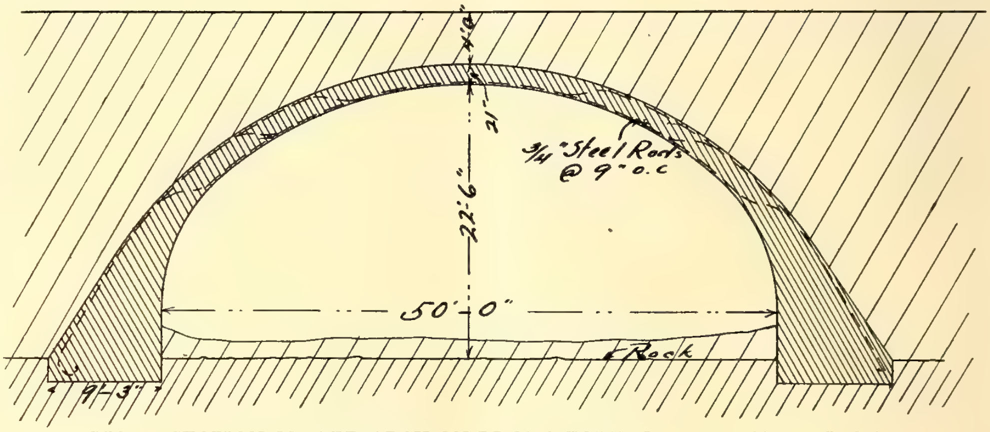


FIG. 6.—SECTION OF 50-FT. ARCH ON LIMA & TOLEDO TRACTION RAILWAY

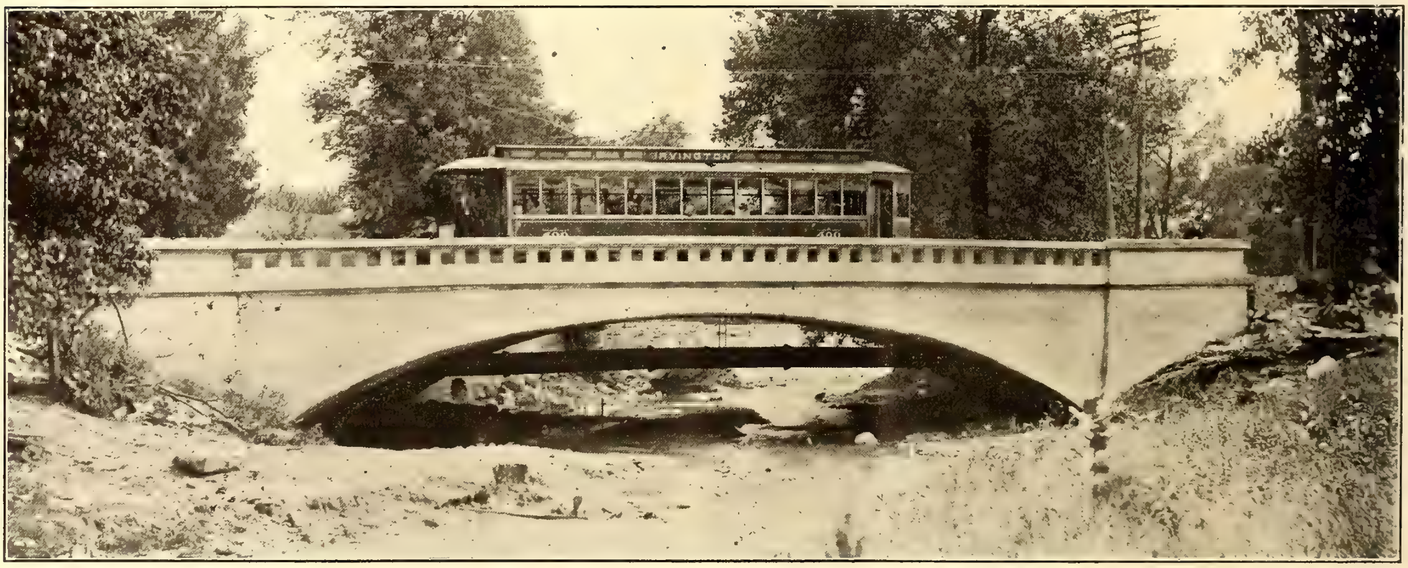


FIG. 8.—A 65-FT. CONCRETE ARCH ON EAST WASHINGTON STREET, INDIANAPOLIS

Fig. 1 is a view of a "horse-shoe" concrete arch of which numbers have been erected on Indiana interurban railways. The end is designed of the "horse-shoe" type for economy of

material, and represents the most efficient type of concrete arch devised. This arch is located on the Indianapolis & Western Railway, three miles west of Danville, Ind., and is of 22 ft. span. The contract price was $1,120. The transverse and longitudinal sections are shown to scale in Fig. 2. Fig. 3 shows a diagonal view of a similar arch, of 6-ft. span, which was built for $385 on the Indianapolis & Northwestern Traction Railway near Zionsville, Ind. This view shows the fit of the "horseshoe" end to the earth slope. These ends are built without any forms other than the drum of the arch, the concrete of the ends being troweled to place, with a guide line stretched at each side of the arch at the slope of the earth filling. Such an arch is from 20 per cent to 30 per cent cheaper than the type with wings and spandrels shown in Fig. 4, a 20-ft. span on the Indianapolis Northern Traction Railway near Noblesville, Ind. The contract price was $1,260. All of the bridges shown in this article were designed for the same loading of 100-ton cars on two trucks, besides the dead weight of earth and concrete.

In all of the above bridges the cross-section of the arch is of the same design, reinforced with rods of smooth, soft steel, embedded near the inner surface at the crown and near the outer surface at the haunches, and crossing the arch ring at alternate points between. By arranging these points of crossing at the middle and third points of the half arch, all possible positions of concentrated loads are provided for, as well as all shearing stresses. The bridges are made floodproof by a reinforced concrete pavement across the bed of the stream, tying the abutments together to resist the thrust of the arch.

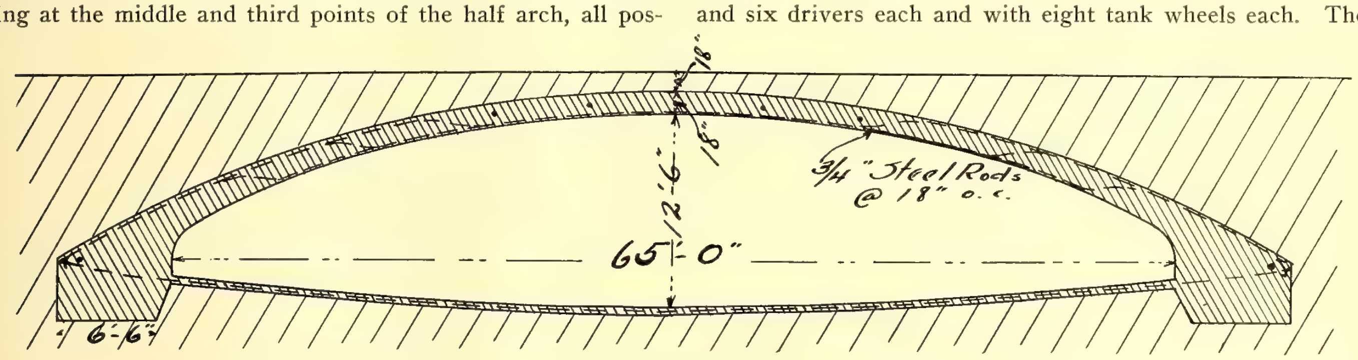


FIG. 9.—SECTION OF EAST WASHINGTON BRIDGE, INDIANAPOLIS

Fig. 5 is a view of a 50-ft. span arch of the same type on the Lima & Toledo Traction Railway three miles north of Lima, Ohio. This arch rests on rock foundation, and the floodproof pavement is consequently omitted. The section is shown in Fig. 6. The contract price was $7,085. In the background is seen a stone arch of three spans on the C. H. & D. Ry., that has proved too weak in the spandrels and has required bracing with transverse tie-rods and timbers, as well as buttressing of the piers.

Fig. 7 is a 24-ft. span on the Lima & Toledo Traction Railway, within a few hundred feet of the 50-ft. span described above. This structure spans a highway with a small stream at the side. The height of opening is 16 ft., and length of arch from face to face 33 ft., carrying a fill over the crown of 8 ft. The contract price was $3,250.

Fig. 8 is the East Washington Street Bridge in the city of Indianapolis, which carries the interurban cars of the Indianapolis & Eastern Traction Railway, running from Indianapolis to Dayton, Ohio, as well as the city cars of the Indianapolis system on its Irvington extension. This bridge is of 65 ft. span and 60 ft. clear roadway. The street is paved with brick, with cement sidewalks and curbs at each side. The railings are of concrete. The contract price was $10,885.

All of these bridges, except the first, were designed and erected by the National Bridge Company, of Indianapolis. The 22-ft. "horseshoe" arch was built by the National Concrete Company on designs and working drawings furnished by the National Bridge Company.

THE CAR WHEEL INDUSTRY

Few persons, even among railroad men, realize the large demands made upon the iron and steel industry of the country by the manufacturer of cast iron and steel wheels. It is estimated by a competent authority in the wheel business that the car wheels at present in use aggregate about 5,000,000 tons in weight. This figure is based upon the following statistics: There are about 1,750,000 freight cars, 40,000 steam passenger cars, 45,000 steam locomotives and 80,000 electric cars in the United States. The freight cars would average eight cast-iron wheels each. The steam passenger cars could be credited with an average of ten wheels each, owing to the extended use of six-wheel trucks. These wheels are probably about equally divided between steel-tired or solid steel and cast iron. The 45,000 locomotives ought to be credited with an average of four small wheels and six drivers each and with eight tank wheels each. The drivers are steel. The small wheels may again be considered as equally divided between cast iron and steel. The electric cars can be said to average seven wheels each, 90 per cent iron and 10 per cent steel. Totalizing these figures, and omitting from consideration hand cars, dump and construction cars, etc., the following table is obtained:

	Drivers	Steel and Steel-Tired Wheels	Cast-Iron Wheels
1,750,000 freight cars	......	......	14,000,000
40,000 steam passenger cars	......	200,000	200,000
45,000 locomotives	270,000	90,000	90,000
45,000 locomotive tanks	......	180,000	180,000
80,000 street cars	......	60,000	500,000
Total	270,000	530,000	14,970,000

The average weight of drivers is about 1½ tons, that of the steel-tired wheels is about ½ ton, and the average weight of the cast-iron wheel is about 600 lbs., making a total of 5,061,000 tons.

This figure gives about what is in use at the present time. If anything, the total is probably greater than that quoted rather than less. A more important question, however, is how many are made each year. To determine this, it may be assumed that the cast-iron wheels used under freight cars are renewed on an average of once in five years, while those under the other rolling stock are renewed annually. The renewals and new cast-iron wheels manufactured would then

be as follows, according to the authority whose estimates are being quoted in this article:

14,000,000 wheels under freight cars, one-fifth renewed, or	2,800,000
Cast-iron wheels under passenger cars, all renewed, or	200,000
Cast-iron wheels under locomotives, all renewed, or	90,000
Same under tank cars, all renewed, or	180,000
Same under street cars, all renewed, or	500,000
Total for present year	3,770,000
The natural increase in use is about 5 per cent each year, or	188,500
For new cars the present rate is about 150,000 to 200,000, 150,000 cars, eight wheels to the car, would equal	1,200,000
Grand total, or average for next year	5,158,500
This will average an increase yearly of from 150,000 to 200,000 wheels, say	150,000
	5,308,000

These wheels, as before stated, average about 600 lbs. each, which means a yearly consumption of 1,591,350 tons.

The steel wheel consumption for last year, according to a large manufacturer of steel tires, was about as follows:

	Drivers	Steel and Steel-Tired Wheels
In passenger service the steel wheels last about five years, or to replace those under the present equipment the yearly demand is about		50,000
Under locomotives, about once in four years	67,500	22,500
Under locomotive tanks, once in four years.		45,000
Under street cars, about once in five years..		12,000
Under new equipment the average increase is about:		
Steam cars		25,000
Locomotives	12,000	8,000
Street cars		5,000
Total for present year	79,500	167,500
Average yearly increase of about 5 per cent equals	4,000	8,000
Or total for next year	83,500	175,500
		Tons
The drivers weigh about 1½ tons, or		125,250
The others about ½ ton		87,750
Total tonnage		213,000
Total tonnage of cast-iron wheels is		1,591,350
Grand total of tons		1,804,350

To produce this, fully 50 per cent of the tonnage, considering new cars, must be new iron. The balance is made up of scrap wheels or other scrap iron. The new iron required, therefore, equals about 900,000 tons, or one-thirtieth of all the new iron that is made in the United States in twelve months.

The figures quoted above are intended to be approximate only, but serve to show the magnitude of this particular part of the railroad business.

The Canton-Akron Railway Company, acting with the Northern Ohio Traction & Light Company, will shortly institute limited service between Canton and Cleveland. The new cars will make the 55 miles in 2 hours and will be an additional to the limited now operating between Akron and Cleveland over the lines of the Northern Ohio Traction & Light Company. Two 50-ft. cars have been secured by the Canton-Akron Company for this service, as it was found impractical to operate its heavy 60-ft. cars on the severe grade of the Akron-Cleveland line.

SHOP KINKS AT SIOUX CITY, IOWA

Several novel devices which either facilitate work or reduce waste have been put into use in the shops of the Sioux City Traction Company at Sioux City, Ia., by C. M. Feist, master mechanic of the system. In these shops all the cars are constructed and all the car repair work is done for the system, which embraces about 43 miles of track in and about Sioux City.

A little device that has effected quite a saving in register rope is a triangle of bell crank which was substituted for the usual pulley at the bulkhead of the car where the register rope turns to pass to the register. The substitutes of the bell crank on all the cars resulted in a saving of $45 worth of register rope in one year.

With an ordinary wrench it is rather an awkward under-

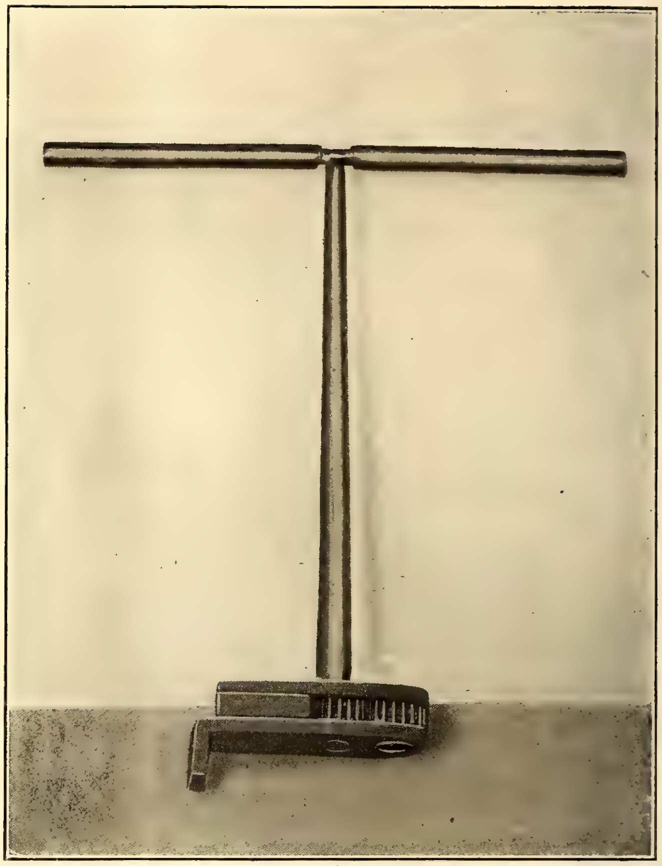


FIG. 1.—EXTENSION SOCKET WRENCH FOR TIGHTENING NUTS ON SPLIT GEARS

taking to tighten the nuts on split gears. Their position is such as to allow the wrench to turn through but a very small angle, and moreover the nut is usually greasy and it is hard to get a firm hold on it with the wrench. To facilitate the work of tightening these nuts, J. A. Rubel, pit foreman, devised the wrench shown in Fig. 1. This is in fact an offset socket wrench. The T-handle turns a cog which meshes with another of equal size containing a hexagonal opening for the nut. The two cogs are carried in a frame provided with an angular extension which when pressure is put on the wrench strikes the gear and prevents the frame turning further.

A device used for babbiting split bearings is shown in Fig. 2. The mandrel and the base block are in one piece. After the bearing shells have been placed in position on the base block the two half shells shown are clamped around them. The illustration shows the fillets on the mandrel which cast the oilways in the babbit. All the axle bearings are cast full size, and are used without being machined. The controllers

of several of the cars of the system are equipped with hand-wheels illustrated in Fig. 3. These wheels, which have a shorter radius than the regular handles, permit the controller to be placed about 4½ ins. nearer the inside finish of the platform. The controller may be turned either by means of the pear-shaped handle or by grasping the rim of the wheel.

A careful record has been kept of the life and the cost of trolley wheels. For one year the total cost per car of the copper consumed in trolley wheels was $1.92. This cost was

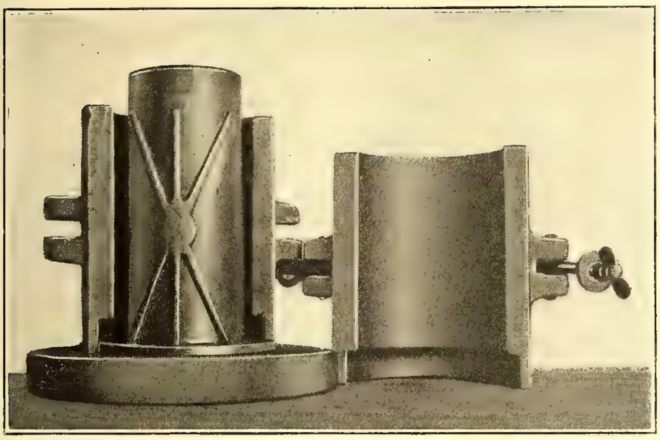


FIG. 2.—DEVICE FOR BABBITTING SPLIT BEARINGS

obtained by deducting from the purchase price the price received for the copper in the scrapped wheel. The style of wheel and harp used is a special one, and was devised by and has been patented by Mr. Feist. Its construction may be gathered from the accompanying illustration. The axle is unusually large, and contains recesses for three radially projecting carbon pencils. The harp proper is made in two halves, each of which is screwed on the axle. Where the wheel is in position the radial pencils, which are forced out-

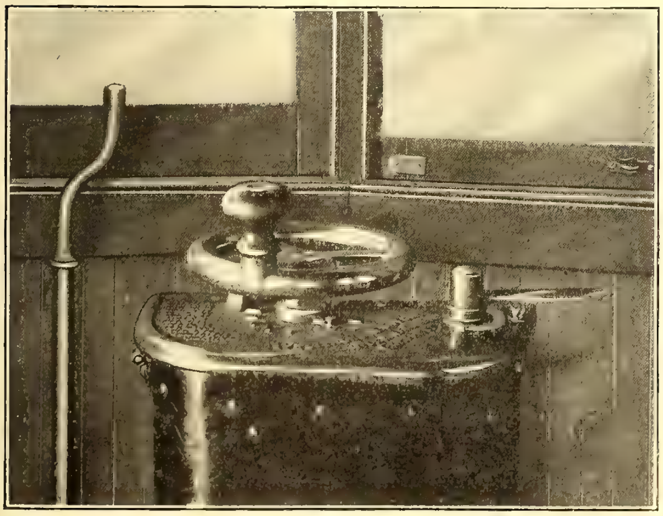


FIG. 3.—HAND-WHEEL USED ON CONTROLLERS

ward by springs behind them, keep the wheel well lubricated. The pencils are of such a length that they last about one year. No oil whatever is used, and the trolleys are said to require practically no attention until the groove is worn out. The life of the wheel is from 18,000 to 20,000 miles.

Oil lubrication has been adopted for the motors originally built for grease by placing a tin cup in the grease boxes. At first considerable trouble was experienced, due to the rattling of the cup in the box and the consequent wearing of holes in the cup, but this trouble has been eliminated by pouring melted sulphur around the cup so as to fasten it securely in place.

The armature shafts of all the motors have their commutator ends covered by a small cap which prevents a great deal of dirt getting into the bearing. This practice, however,

FIG. 4.—TROLLEY-WHEEL AND HARP ASSEMBLED AND TAKEN APART TO SHOW THE LUBRICATING PENCILS

is followed in many other shops, and some motors are supplied with such caps by manufacturers. While it is a minor point, it is one which no doubt prevents a great many bearing troubles.

The type of fender used on the cars is that which is built in the shops, and is shown in one of the reproductions. The

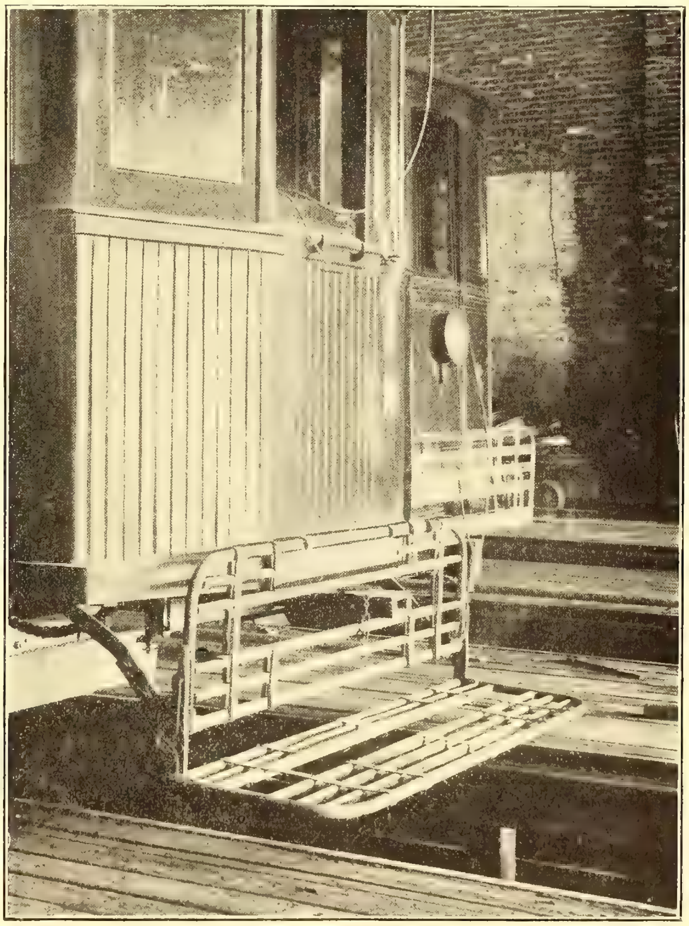


FIG. 5.—TYPE OF FENDER USED ON SIOUX CITY CARS

lower portion is hinged and arranged to fold up against the upper part. When so raised the fender is close up against the bumper of the car, so that it does not interfere with the coupling together of two cars equipped with fenders.

The Indiana, Columbus & Eastern Railway Company has instituted a limited service between Dayton and Springfield. The cars will cover the 28 miles in 55 minutes.

NEW ALL-STEEL PASSENGER CAR FOR THE PENNSYLVANIA RAILROAD

The Pennsylvania Railroad has recently completed at its Altoona shops an interesting type of all-steel passenger car, which is intended for its tunnel service into New York and involves a number of important departures from previous constructional methods. Throughout the whole design of the car the aim has been to obtain a greater amount of strength than could be obtained with wooden construction; a complete steel framing, which could not be affected by fire, and an inside lining which is non-inflammable, and at the same time one which will not conduct heat or sound.

INTERIOR OF PENNSYLVANIA RAILROAD STEEL CAR

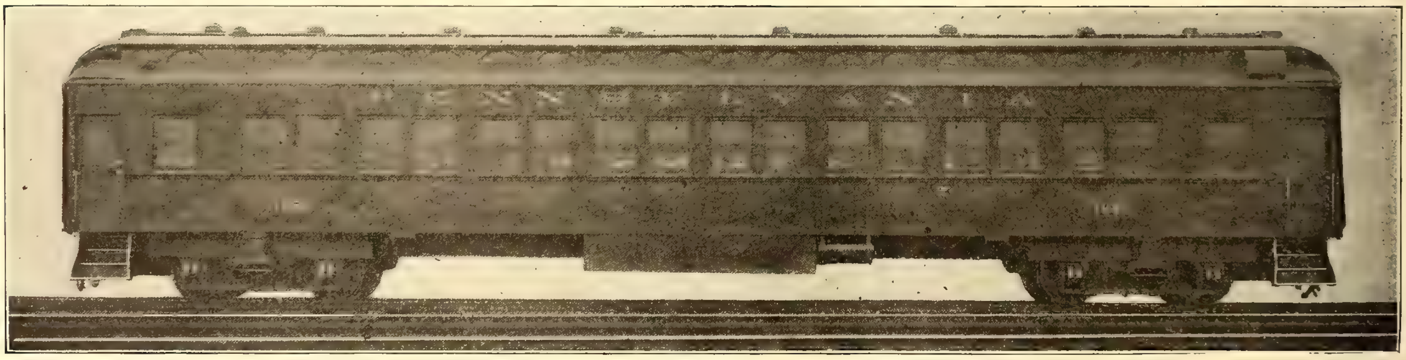
The principal feature of the construction of the body of the car is a center sill member in the form of a central box girder 24 ins. wide by 19 ins. deep, extending throughout the length of the car, including platforms. This girder forms a backbone which supports the rest of the car and at the same time gives such great strength to the body structure that there will be less possible danger to passengers, due to breaking up of the car in case of collision. The sides of the car are composed of deep steel girders of very great strength and strongly reinforced, The platform is composed of steel plates attached to the center sill construction, and covered with a cement finish imitation of stone, which is spread over the steel plates while in a plastic state.

The vestibule end and corner posts are designed to furnish a maximum of strength for the amount of material used and are securely riveted to the center sills and end rail. The end door posts are of rolled material of very deep section, securely riveted to the center girder construction at the bottom and to a horizontal strengthening plate at the top, presenting a feature of strength which is absent from present passenger car construction. This great strength in the door and vestibule end posts will, in case of collision, and the body of one car rising above the body of the next car, tend to prevent the tendency for the underframe of the first car to sweep the superstructure of the second car from its underframe. The vestibule ceiling consists of a wide horizontal steel plate, reinforced in such a manner that it forms a girder braced to the side and roof framing of the car and prevents the collapse of the roof end.

The side framing is supported by cantilevers—four on each side, extending on either side from and supported by the center girder construction. Riveted to and rising from the side girders are steel posts of the strongest available section, spaced about 6 ft. apart, which support the roof and parts depending from the roof. Opposite side posts are connected by steel carlines of similar section, and the ends of the posts are tied together throughout the full length of the car by angles extending continuously throughout the length of the car and attached to the vestibule roof sheets at the ends. Further longitudinal bracing consisting of six angles, located between the angles connecting the ends of the posts, form a substantial connection for the carlines and roof, and are attached at the ends of the car to the vestibule roof sheets.

The inside lining consists principally of steel plates except directly under the roof, where the usual composite board is retained. The outside sheathing of the roof also consists of steel, so that the whole outside of the car presents one unbroken expanse of steel plate with openings for the windows. The doors are composed of steel plates pressed into a shape imitating wooden doors used in other cars with a cork filling to deaden the sound. The seats are composed of steel frames throughout, covered with fireproof plush. The foot-rests are of steel; in fact, no wood or inflammable material whatever has been used, except the top of the seat arm, which was made of wood for comfort of passengers, as steel was considered cold to the touch. Experiments will be made with seat arms made of metal, to determine the amount of discomfort and also whether it would be advisable to substitute metal. The inside flooring of the car consists also of a cement composition in imitation of stone, which in its plastic state has been spread over the foundation sheets, consisting of corrugated iron, which in turn is riveted to the center sills and side framing of car.

In order to obtain the best possible results from steel construction, it was necessary to consider a redesign of the trucks to provide for a main central body frame of twice the depth that is used in wooden passenger car construction. The trucks consist of a frame work made entirely of steel



THE FIRST ALL-STEEL CAR FOR THE PENNSYLVANIA RAILROAD'S NEW YORK TUNNEL SERVICE

and considerably stronger than truck frames now in general use; a bolster passing underneath the frames and provided with side bearings placed directly under the sides of the car to promote easy riding; a location of helical and elliptical springs which, from long experience, has been found to be most advantageous; axles of a large diameter, and rolled steel wheels.

The car is equipped for electric lighting only, the current supply for which is furnished by storage batteries. The wiring has been carefully insulated and is carried in metal conduits. The storage batteries are carried in steel boxes, which are hung from the underframe of the car. The Pennsylvania Railroad standard ventilating system is used and also the four-type heating system. The paint used on this car is fireproof throughout. General dimensions of the steel passenger cars follows:

	Ft.	Ins.
Length over buffers	67	5¾
Length over body corner posts	58	11¾
Length between bulkheads	47	4
Width over upper deck eaves	7	7
Width over lower deck eaves	10	1
Width over letter board	9	10½
Width over sheathing	9	9¾
Width inside of finish	8	11½
Height to top of car from rail	14	0½
Height to top of belt rail from rail	6	7½
Height to top of floor from rail	4	4
Height to bottom of car from rail	3	7½
Distance between truck centers	45	3
Diameter of wheels	3	0
Distances between centers of windows	2	11½

THE AUTOMOTONEER IN ITS LATEST FORM

The automotoneer, which is made by the Garton-Daniels department of the Electric Service Supplies Company, although a very simple device in itself, has required a remarkable amount of ingenuity and experimental work to perfect it. For the benefit of readers who may not be familiar with the history of this retarding device for controller handles which is now in use upon many hundreds of cars in the United States, it may be well to explain that it was invented and the original patent application filed about nine years ago by M. K. Bowen, general manager, and George W. Knox, electrical engineer of the Chicago City Railway Company. The original device as constructed by Mr. Knox and tried upon some of the cars of the Chicago City Railway differed considerably from the present automotoneer. In fact, although the device apparently is one which would be easy to construct, many years of inventive skill and experiment had to be spent upon it to make a device which would stand commercial service. The first automotoneers were placed inside the controller with the idea that they would be more out of the way and less likely to be tampered with. The difficulties of crowding them into most controllers and the greater ease of application caused the designers later to adopt a type which is placed on top of the controller. Dozens of designs and mechanical movements were tried during the experimental period. The latest type of this device is shown by the accompanying illustrations. The object of the automotoneer is, of course, to make it possible for the motorman to move his controller handle but one notch at a time. After he has advanced one notch, he cannot go to the next until a

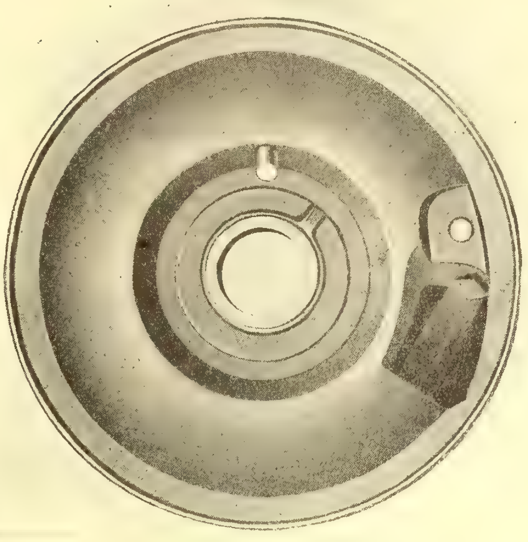


FIG. 2.—INSIDE OF UPPER CASING OF AUTOMOTONEER

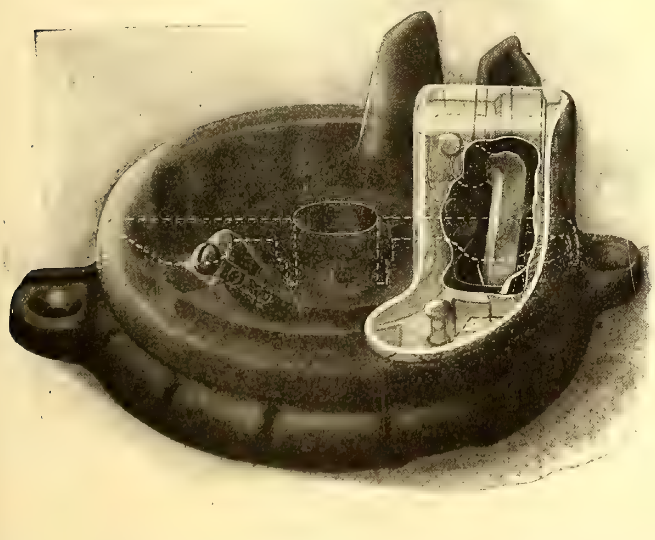


FIG. 1.—AUTOMOTONEER, SHOWING ARRANGEMENT OF DOG

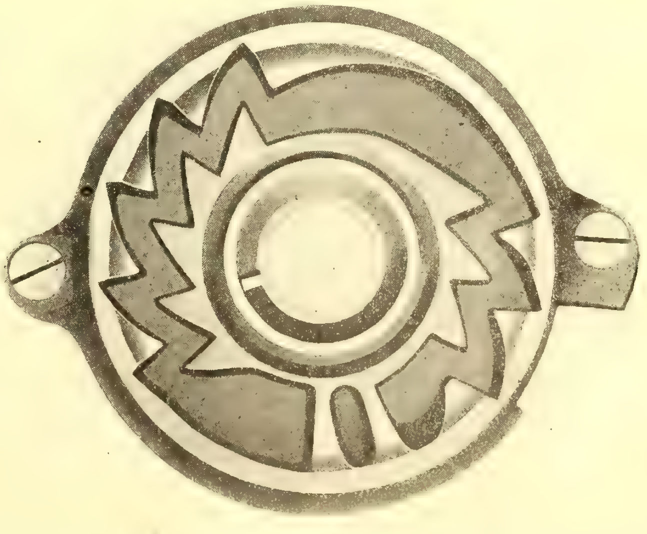


FIG. 3.—LOWER PART OF AUTOMOTONEER, SHOWING ZIG-ZAG GROOVE

certain time has elapsed. No restriction is placed on the turning-off movement of the controller.

Referring to the illustrations, an engaging dog hung from a ball and socket joint is so formed that of its own weight it rests against the inside rim of the zig-zag groove shown in Fig. 3. The movement of the controller handle causes the dog to follow the cam surface of the inner rim which directs it toward the first stop point of the outer rim. This throws the dog into the angle formed by the first projection or stop of

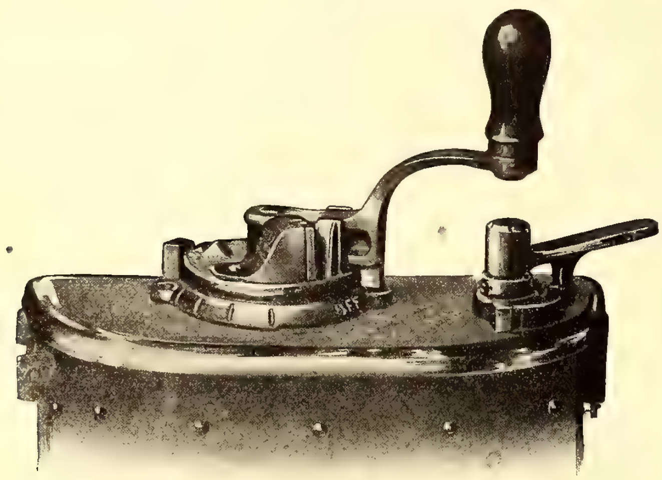


FIG. 4.—THE AUTOMOTONEER INSTALLED

the outer rim, forcing it against the upper casing. This stops the movement of the controller handle. By this simple construction all springs, pivots, hinges, etc., are done away with, except the sturdy ball and socket joint. This is made so free and loose that there is nothing to stock, rust, or get out of order. No oiling is needed.

The automotoneer is so adjusted on the controller that when the dog is in the locked position, the star-wheel roller inside the controller is just ready to go over the next point. This exerts a slight pressure that tends to throw the controller handle back a fraction of an inch as soon as the pressure of the motorman's hand on the controller handle is released. This releases the automotoneer dog and permits it to drop into the inner groove ready for work on the next point. This continues throughout the entire course of the controller handle in turning on current, and on most controllers for city cars forces a sufficient pause at each point to allow the motors to accelerate properly before more current is turned on.

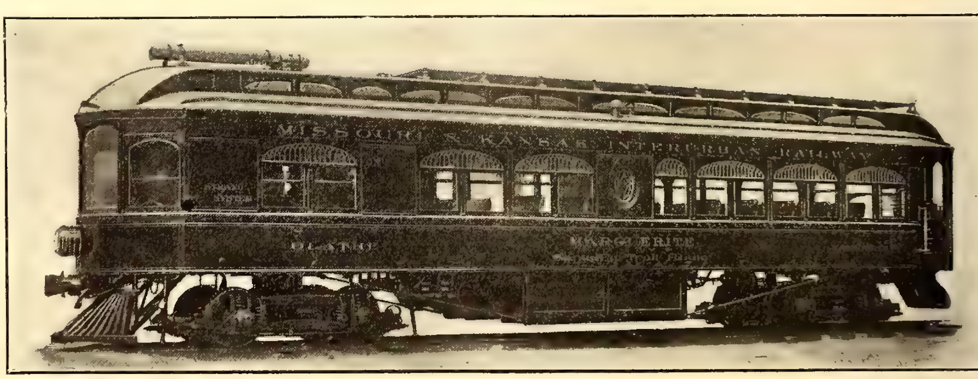
The upper casing of the automotoneer is so made that there is a sufficient space left to allow the dog to swing back out of engagement with cams and stops, when the current is being turned off. The position of the dog is shown in Fig. 1. In turning off current it presents no opposition whatever, and instead of engaging each stop as it does in the forward movement, it simply slides along.

The upper casing of the automotoneer is provided with a sliding bolt shown in Fig. 2 covered on the surface by a short screw shown in Fig. 1. When the casing is in place upon the lower part of the automotoneer, this bolt drops in the groove shown in Fig. 3, fastening the upper and lower parts together, so that they cannot be separated without removing the automotoneer from the controller and turning it upside-down. Fig. 2 shows this bolt in its proper position when the upper casing is placed upon the lower. This arrangement prevents any tampering on the motorman's part. The head of the small screw, shown to cover the sliding bolt, may be cut off flush. This absolutely prevents removing the bolt, although it may be pushed out of engagement when the automotoneer is removed from the controller for inspection.

The advantages of the automotoneer in smoother acceleration, less jerking of passengers, less wear and tear on the equipment, and saving in power, have been thoroughly discussed in past issues. Experience with the device, now that it is in use on a large number of cars, seems to have shown that while the power-saving feature may have been overestimated, the reduction in repairs to motors and other parts of the rolling stock by the use of this device have been very much underestimated.

NEW ROLLING STOCK FOR THE STRANG GASOLINE ELECTRIC RAILWAY CAR SYSTEM

In the STREET RAILWAY JOURNAL of March 3, 1906, there appeared an article describing a new gasoline-electric car built for the Strang Electric Car Company, of New York City, by the J. G. Brill Company. Numerous trial trips had been taken over the main line of the Baltimore & Ohio Railroad between Philadelphia and Wilmington, and prominent officials of that road and also of the Pennsylvania Railroad had participated in these trips. As the article above referred to was going to press, the "Ogerita," that being the name of this gasoline-electric car, was about to set on a journey to Kansas City from Philadelphia, via the Pennsylvania, West Shore, Lake Shore, Alton and Rock Island railroads, stops being made at principal points en route to enable railway officials to come aboard and inspect the system and journey on with the



THE NEW GASOLINE-ELECTRIC CAR "MARGUERITE"

car as far as was desirable. No changes in equipment from that first installed were required, the engine behaving perfectly under the most adverse conditions. The average speed for most of the distance averaged about 45 miles per hour. Snow storms retarded the progress of the "Ogerita" on several occasions, and in some instances it was necessary to run behind freight trains, which reduced the average for the entire trip to about 33 miles per hour. Arriving at Kansas City, another trip was taken over the Santa Fe Railroad to Topeka and return. On the return journey the "Ogerita" ran into a heavy snow storm, the drifts being unusually deep. Regular trains on the road were brought to a standstill, but the

"Ogerita" is said to have acted like a snow plow and completed her journey on schedule time. Another trial trip through the Southern part of Kansas covered about 550 miles, the car averaging about 40 miles per hour, despite grades of 3½ per cent and curves as high as 16 degrees.

Last April the "Ogerita" commenced making regular trips on a line built by Mr. Strang, known as the Santa Fe Trail Route, and running between Kansas City and Olathe, Kansas, about 22 miles. The car is now operating between Kansas City and Lenexa, the latter place being about 15 miles distant from Kansas City. Four round trips are made daily, and one and two trail cars are used. Not a single trip has been missed for any cause whatsoever since its initial run on this line.

To hasten the completion of this new line and no locomotive being available for handling steel and ties, the "Ogerita" assumed the role of a freight engine. The present equipment for the road is entirely inadequate to meet the heavy traffic conditions, but will be relieved when the two handsome new cars, one of which appears in the illustration, are placed in commission, to take their regular turns with the "Ogerita." The cars for the line are being built by the J. G. Brill Company, and are mounted on that company's high-speed trucks. The car illustrated is the standard type of combination passenger and smoker used. The "Marguerite" has already had some trial trips and will be at once sent West to join the "Ogerita" and the "Geraldine."

The new cars measure 48 ft. over the end panels and 52 ft. 9 ins. over the crown pieces; width over the sills, including

GASOLINE-ELECTRIC HAULING TWO TRAILERS IN SERVICE BETWEEN KANSAS CITY AND LENEXA

sheathing, 9 ft. 6 ins.; sweep of the posts, 2 ft. 8 ins.; size of the side and end sills, 5¼ ins. x 8⅞ ins.; thickness of the corner posts, 3⅝ ins.; thickness of the side posts, 2¼ ins. x 4½ ins. The length of the passenger compartment is 27 ft. 5 ins.; the smoking compartment measures 10 ft. 8 ins.; while the engine room is 14 ft. 8 ins. The seats are covered with red leather and harmonize with the green tint of the interior woodwork, and comfortable armrests are provided on the aisle side of the car. At the forward end of the passenger compartment and on the left-hand side of the car is a saloon with water cooler in alcove and a small folding lavatory with the usual adjuncts; the small oval window of opalescent glass will mark the position of the saloon in the picture. The engine room has a double window on the one side and a double sliding door on the other with a 5 ft. 6-in. opening. A removable partition is placed at the rear of the engine room, 2 ft. 8 ins. from the partition, separating the engine room from the smoking compartment; the space between these partitions to be used for a tank room. The engine is a four-cylinder vertical type, with 10-in. x 10-in. cylinders; the engine requires no attention while running, as the regulating apparatus is automatic; therefore one man can operate both car and engine.

NEW YORK STATISTICS FOR THE LAST QUARTER

The quarterly statement of passengers carried, car-miles run, etc., by the roads in New York City during the three months ending June 30, 1906, has just been published by of transportation of the West Penn Railway Company, of

TABLE SHOWING STATISTICS OF RAILWAYS IN NEW YORK CITY FOR QUARTER ENDING JUNE 30, 1906

	Cash Fares	Increase	Transfers	Increase	Car Miles	Increase	Passengers per Car Mile *	Increase
Interborough elevated	64,164,266	4,612,563	....	....	15,412,542	‡ 460,871	4.16	.09
" subway	37,161,607	10,219,312	....	....	8,656,535	961,413	4.21	.71
New York City (surface cars)	101,971,283	2,911,928	46,844,211	5,693,687	14,897,170	‡ 787,561	9.99	.73
Brooklyn R. T. (all lines)	96,275,361	7,700,572	33,114,345	12,756,595	16,970,757	965,913	7.62	.82
Coney Island & Brooklyn	9,462,173	517,083	1,660,242	‡ 46,871	1,813,041	‡ 25,876	6.13	.17
Union Railway †	8,829,084	2,809,223	4,299,266	151,967	1,988,283	331,767	6.60	.46
New York & Queens County	4,949,173	467,732	1,212,174	188,094	956,972	74,776	6.44	.20
All roads in New York	332,384,850	29,925,163	87,519,273	18,903,364	61,757,448	1,252,881	6.79	.66

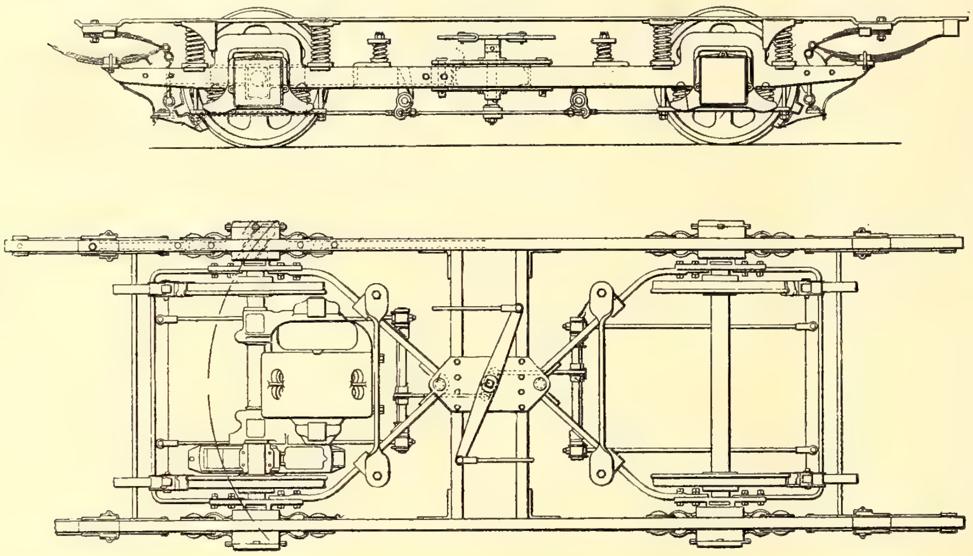
* Including transfers. † Including Southern Boulevard. ‡ Decrease.

Railroad Commissioners of New York State. The statistics for the principal lines, as well as for the city at large, are presented in the accompanying table.

Originality in advertising counts for as much in the street railway business as in almost any other line. The man who gets up unique and attractive advertising is certain to improve the business of his road. W. K. Brown, superintendent Connellsville, has recently invented several ingenious little schemes for promoting business for his road. At all the hotels in the district, the traveling man, after eating his meal, picks up a quill toothpick bearing the words "Pick the West Penn Railways, the road that runs on time." Mr. Brown has taken advantage of the souvenir postal card fad by placing racks of cards illustrating many views on this system in all of the waiting rooms and at many news stands in the towns in near districts. The cards are sold at about cost and have spread the fame of the West Penn system all over that section.

THE COOK RADIAL TRUCK

One marked difference between European and American practice in rolling stock is the extended use abroad of radial trucks. Not only are many electric cars in Europe fitted with radial trucks, but a considerable proportion of the steam carriages are equipped with running gear which allows the axles to assume a radial position while passing around curves. In electric railway practice, particularly in England, it is not uncommon to see cars with a 9½-ft. wheel base passing around short radius by the use of this radiating principle. In the city of Birmingham alone there are about 300 cars mounted on radial trucks, and the latest orders from this city have been for trucks of this description. The advocates of radial trucks claim a large reduction of power, not only on curves but also on straight track, due to the decreased tendency to "hunt" and the consequent less flange friction. The larger wheel base also gives a better riding car, and it is claimed that many cars with 30-ft. body or shorter in this country, now mounted on double trucks, could be carried on a single 4-wheel radial truck to advantage.



FIGS. 1 AND 2.—SIDE ELEVATION AND PLAN OF RADIAL TRUCK

The accompanying engravings illustrate the Cook radial truck, of which more than 1000 have been built by the Brush Electrical Engineering Company, of Loughborough, England, and which was invented by E. E. Cook, formerly of the McGuire Manufacturing Company, of Chicago.

This truck combines with a rigid frame two radial axles which swivel from points near the center of the truck frame, as shown in Figs. 1 and 2. The radial action takes place in the journal boxes, Figs. 3, 4 and 5, which are of ingenious construction. Each consists of an outer box, Fig. 4, and an inner box, Fig. 3, in which the axle revolves. The four sketches in Fig. 3 illustrate respectively a plan, section on the line *AB*, a longitudinal section and a front elevation of the inner axle box. This inner box moves vertically with the outer box, but is also capable of a sliding or lateral movement therein. This is accomplished by making the outer box considerably wider than the inner box and providing it with curved guides at the top and bottom. These guides are shown in Figs. 5 and 6. They are in the form of ribs and engage with correspondingly formed grooves 3 and 1 at the top and bottom, respectively, of the inner box. The guides are not made in one with the outer box but have bosses, 2, which allow them to swivel in the outer box. The top guide, Fig. 5, as shown, is made to slope slightly from its outer ends to the center, and the upper groove 3 of the inner box is curved to correspond with this slope. The result is that when the axle swivels away from the center it must slightly lift the car body by means of an inclined plane of slight pitch; that is, when the car strikes a curve, the greater the speed the greater is the swiveling effect. This is, of course, as it should be. The effect of the radial action consequently is to cushion the shock of the car body at the entrance of curves and switches, and also to reduce the wear and tear of the track and car wheels at these points. With the narrow grooved rails, common in England, this saving in wear on special work is of considerable importance. Tests made on current consumption by the British Electric Traction Company on cars equipped with a 6-ft. rigid wheel base truck as compared to radial trucks of 9½-ft. wheel base show much less current consumption both on curves and straight work with the radial trucks than with the rigid wheel base trucks.

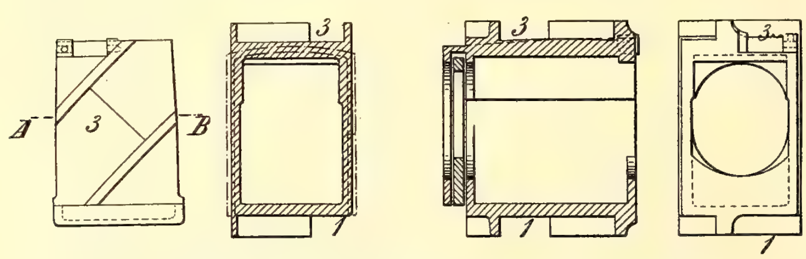


FIG. 3.—PLAN, SECTION ON *A B*, LONGITUDINAL SECTION AND FRONT ELEVATION OF INNER AXLE-BOX

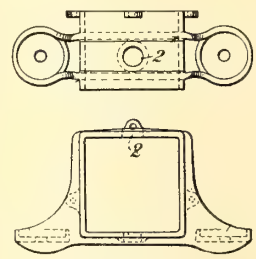
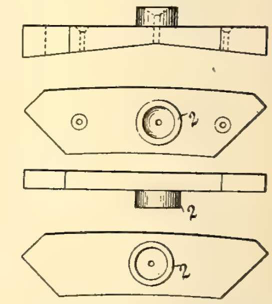


FIG. 4.—OUTER BOX, IN WHICH INNER BOX SLIDES



FIGS. 5 AND 6.—CURVED GUIDES PROVIDED FOR THE OUTER BOX

The traction lines of Central and Western Ohio, acting in conjunction with the Nickle Plate and another steam railroad, last week made a bid for the cheap excursion business to Chicago. The Indiana, Columbus & Eastern Traction Company had 125 passengers from Springfield, Ohio, to Chicago, and a number from Columbus. The Dayton & Troy and Western Ohio lines handled a number of people out of Dayton and other points, while the Ft. Wayne, Van Wert & Lima handled a good party out of Lima and other towns on its line. The Erie, Hocking Valley, Ohio Central steam railroads attempted to thwart these excursions by offering low rates direct, but the novelty of a long trolley trip brought the electric traction lines a very creditable portion of the business.

FINANCIAL INTELLIGENCE

Wall Street, Aug. 15, 1906.

The Money Market

Money market conditions have not changed materially during the past week. Lenders generally continue to hold the market for over-the-year maturities at 5¾ per cent, and while there is not a great deal of business reported at that rate, still there is no disposition on the part of the banks and other institutions to press their funds upon the market, the belief being pretty generally entertained that higher rates will prevail in the near future. There has been a decided falling off in the offerings of out-of-town money in the local market, due to the fact that arrangements are being made at inland cities to finance the crops. Rates of exchange on New York at Chicago are somewhat harder, indicating an increasing demand for money at those points. The outward movement of money from New York may be said to have begun, a small amount having been shipped direct to St. Louis this week. It is not expected, however, that the movement will assume large proportions for several weeks to come. In the meantime New York banks will probably strengthen their reserves, and be in a position to meet any demand for crop-moving purposes that may be made upon them. The banks lost a considerable amount of cash last week, due in part to the heavy custom collections, and the payment for the Panama Canal bonds, which now aggregate $14,000,000. It is expected, however, that during the current week, the New York City banks will gain cash considerably. A feature of the week has been the weakness in sterling exchange, the rate for demand bills dropping 65 points to 4.8465. The decline was due to the unusually heavy offerings of cotton bills at Southern ports. At the low level of exchange it was expected that local bankers would obtain the greater part of the £500,000 gold arriving in London from South Africa on Monday last. The bulk of the gold, however, went to a German institution. However, local bankers are of the opinion that they will be able to obtain all the gold required in the European markets when needed. It is expected that the offerings of cotton and grain bills will be extremely heavy in the near future, and will be sufficient to depress the rates of exchange to a point where gold can be readily secured. The European money markets have been somewhat easier, this being particularly so at Paris, owing to the improvement in the Russian situation. The bank statement published on Saturday last was decidedly unfavorable, the clearing house banks reporting a decrease in cash of $9,274,900, and a decrease in the surplus reserve of $5,851,150. The surplus now stands at $8,271,525, as compared with $12,846,800 in the corresponding week of last year, $57,751,475 in 1904, $21,563,575 in 1903, $7,126,600 in 1902, $18,421,900 in 1901, and $28,125,950 in 1900.

Money on call has loaned at 5 and at 2½ per cent, the average rate for the week being about 3¼ per cent. Time loan rates are about ¼ higher than those prevailing at the close of last week. Quotations are 4¼ and 4½ per cent for sixty days, 4¾ per cent for ninety days, 5¼ per cent for four months, and 5¾ and 6 per cent for five and six months. Mercantile paper remains quiet at 5¼ per cent, the minimum for prime names.

The Stock Market

The stock market has shown rather decided strength during the week, and prices are higher all along the line, and in some instances new high records for this movement. Sentiment is more friendly to the upward movement, and developments have been of a character to encourage a better feeling. Much attention is being paid to prospective dividend increases, especially on the Harriman stocks, on which action is likely later in the week. There has been much talk of an increase in the Union Pacific rate to 7 per cent, with the probability that an initial dividend will be declared on Southern Pacific at the rate of 4 per cent. The Atchison directors, and also the Louisville, the Norfolk & Western and the Chesapeake & Ohio are counted upon to increase the distribution to their stockholders, and the large increase in the earnings of all these roads certainly warrants such action. The money market has worked somewhat firmer, as a result of demands from the interior for crop purposes, and this demand will now increase, but the Treasury Department can be depended upon to furnish relief whenever the situation calls for such action. The engagement of $2,000,000 gold in Europe had a favorable influence, but our bankers are not likely to get much of the yellow metal from the other side until cotton begins to move out in a more liberal manner. This movement promises to be earlier than usual, and cotton bills are coming in more freely. The heavy and rather aggressive buying of Pennsylvania gave rise to a rumor that the dividend might be increased to a 7 per cent basis, but there does not appear to be any good ground for this. The general market situation is more encouraging, and the only drawback to a bull market of importance is the possibility of firmer money during the crop-moving period. If the dividend on Union Pacific is increased and Southern Pacific is placed in the dividend list it will have a good effect upon the entire market, and will stimulate speculative interest. The indications point to further improvement in prices, and the banking and other large interests are doing what they can to encourage confidence in the situation. The crops are making good progress, and barring accident the harvest returns will be of record volume.

Brooklyn Rapid Transit was an exception to the general strength, and was sold freely, on the decision that the 10-cent fare to Coney Island is illegal, and on the action of the company in suspending its summer schedule to the seaside as a result of the disturbances which have followed. The earnings of all the traction companies show a large increase, and it is announced that the Brooklyn Rapid Transit will carry the 10-cent fare fight to the higher court.

Philadelphia

Although a very small volume of business was transacted in the local traction issues during the past week, prices generally held firm in sympathy with the improvement in the general securities market. American Railways was a prominent feature of the week's trading, the price advancing nearly 2 points to 54 on the purchase of nearly 1500 shares. There was no news to explain the marked strength in these stocks. Otherwise the price movements were confined to narrow limits. Philadelphia Rapid Transit was dealt in to the extent of about 1500 shares, at prices ranging from 30½ to 30 and back to 30¼. Philadelphia Company common sold at 51 and 50½ for odd lots, and transactions in the preferred stock were made at 51. Philadelphia Traction was strong, sales of about 200 shares being reported at 98½ and 99. Other transactions included Rochester Railway & Light at 100 and 101, United Companies of New Jersey at 255, Lehigh Valley Traction preferred at 22¾, and Union Traction at 63¾.

Baltimore

Trading in the Baltimore traction issues was not heavy, and prices were inclined to sag. The greatest activity developed in United Railway income bonds, of which about $130,000 changed hands at prices ranging from 71¾ to 70⅝. The refunding 5 per cents were fairly active, about $68,000 selling from 90⅜ to 88¼. Certificates representing income bonds deposited brought 69 for $5,000, and upwards of $55,000 of the 4 per cent bonds brought 92⅛ and 91¾. The free stock sold at 15¼ and 15 for 200 shares, and 150 shares of the deposited stock sold at 15½.

Other Traction Securities

A feature of the Boston market has been the wide fluctuations in Boston Elevated on rather light transactions. Opening at 150, the price dropped to 147, but at the close there was a full recovery to 150. Only odd lots were traded in. Boston & Suburban brought 20 for a small lot. Boston & Worcester common advanced from 28½ to 29, while 475 shares of the preferred changed hands at from 80 to 79 and back to 79¼. Massachusetts Electric common sold at 19½ and 20, and the preferred rose from 68½ to 69½. West End sold at 95 and 94½, and the preferred at 110½ and 110. Trading in the tractions at Chicago was practically at a standstill. West Chicago sold at 30 and 29¼ for small amounts. South Side Elevated was strong with sales at 98. Chicago & Oak Park sold at 6 and 5⅞, and the preferred at 20¼ and 20.

Tractions were comparatively inactive at Cincinnati last week.

Cincinnati Street Railway sold at 143 even with the previous sale. Detroit United gained a point to 96. Cincinnati, Newport & Covington preferred was stationary at 97½. Cincinnati, Dayton & Toledo declined fractionally to 26⅝, a block of the 5s of this company sold at 93. Toledo Railways & Light suffered a fractional decline to 32⅜. Cleveland Electric sold unchanged in Cleveland the latter part of the week. In spite of the court decision, which Mayor Johnson claims favors the city, the stock did not slump below 70, where it has stood for several weeks. About a thousand shares changed hands. Lake Shore Electric declined a point on news of the terrible accident referred to in this paper last week. It has been pointed out, however, that there was no good reason for this, as it is claimed that the company is protected by an accident fund which will cover the loss. The approaching consummation of the purchase of the Canton-Akron by the Northern Ohio Traction & Light caused a slight decline in the stock of the latter company, because it is probable that many of the Canton-Akron holders who received the Northern Ohio stock will place it on the market. Several lots of Northern Ohio sold at 28¾, lower than it was sold for several months. Cleveland & Southwestern Traction sold at 16, a fractional advance on news of a fine statement for last month. A block of this company's 5s sold at 93½, a jump of 3½ points from the last sale. Bidding for Aurora, Elgin & Chicago preferred was strong, and the price jumped three-fourths of a point to 78¼. The earnings of the company are responsible for the increased price.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Aug. 8	Aug. 15
American Railways	52⅛	54
Boston Elevated	*147	149
Brooklyn Rapid Transit	80⅛	76⅜
Chicago City	160	160
Chicago Union Traction (common)	4¾	4¾
Chicago Union Traction (preferred)	15	15
Cleveland Electric	81	81
Consolidated Traction of New Jersey	78	78
Consolidated Traction of New Jersey	78	78
Detroit United	94¾	92
Interborough-Metropolitan, W. I.	36½	36½
Interborough-Metropolitan (preferred), W. I.	77⅛	78¼
International Traction (common)	a55	a55
International Traction (preferred), 4s	78	78
Manhattan Railway	147	—
Massachusetts Electric Cos. (common)	19¾	19½
Massachusetts Elec. Cos. (preferred)	69½	69
Metropolitan Elevated, Chicago (common)	28	28
Metropolitan Elevated, Chicago (preferred)	66½	68
Metropolitan Street	—	106
North American	95½	95¼
North Jersey Street Railway	27	27
Philadelphia Company (common)	50¾	50¼
Philadelphia Rapid Transit	30⅜	30
Philadelphia Traction	98¾	98¾
Public Service Corporation certificates	68	68
Public Service Corporation 5 per cent notes	95½	95½
South Side Elevated (Chicago)	96	96
Third Avenue	124	126
Twin City, Minneapolis (common)	113	112½
Union Traction (Philadelphia)	63⅝	63½
West End (common)	—	—
West End (preferred)	—	—

a Asked. * Ex dividend.

Metals

Great activity continues in all branches of the iron and steel markets. Producers report an extremely heavy demand for steel for next year delivery, and it is said that some of the independent mills have withdrawn from the market for this year's deliveries. Iron remains unchanged, but in some quarters higher prices are predicted for finished products. Pig iron continues in enormous demand at full prices. No. 2 Southern Foundry at Birmingham is quoted at 15 and 15.25, and No. 2 Northern is quoted at 18.25 and 18.75.

Copper metal ruled firm, but unchanged as to price. Quotations are 18⅝ and 18¾c. for lake, 18⅜c. asked for electrolytic, and 18 and 18¼c. for castings.

INTERBOROUGH-METROPOLITAN STATEMENT FOR QUARTER ENDED JUNE 30.

The statement of the Interborough-Metropolitan Company for the quarter ended June 30, issued Aug. 14, with a similar statement for the New York City Railway Company and its allied companies, shows a surplus of $56,125, or approximately one-sixteenth of 1 per cent on its $100,000,000 of common stock. This is at the rate of one-quarter of 1 per cent a year. Compared with last year's figures at this time, which, though the Interborough-Metropolitan Company was not yet organized, may be computed from the earnings of the constituent companies, the surplus shows an increase above the then deficit of $584,517. The showing made by the merged company is largely due to an increase in gross earnings from operation of $939,867, and a decrease in operating expenses of $18,908. The decrease in operating expenses is to be chiefly credited to the surface lines.

The consolidated statement of the New York City Street Railway Company shows a decrease of $62,648 in expense of operation and an increase in gross returns from operation of $198,546. The statements of the two companies follow:

INTERBOROUGH-METROPOLITAN COMPANY

Statement showing combined operations of the Interborough Rapid Transit and New York City Railway systems for the quarter ended June 30, 1906, and 1905:

	1906	1905
Earnings from operation	$11,030,377	$10,090,510
Operating expenses	5,280,646	5,299,554
Net earnings	$5,749,731	$4,790,956
Other income	240,670	275,853
Gross income	$5,990,401	$5,066,809
Interest and rentals, including 7 per cent per annum on unexchanged Metropolitan Street Railway Company stock and 5 per cent per annum on Interborough-Metropolitan Company preferred stock	$4,486,268	$4,319,619
Taxes, excluding special franchise taxes of New York City Railway system in litigation	660,508	575,582
Total interest, rentals and taxes	$5,146,776	$4,895,201
Balance	$843,625	$171,608
Dividends on Interborough Rapid Transit Company stock	787,500	700,000
Surplus	$56,125	....

NEW YORK CITY RAILWAY COMPANY AND ITS ALLIED COMPANIES

Consolidated statement of income for the three months ended June 30, 1906, and June 30, 1905:

	1906	1905
Gross earnings from operation	$5,740,213	$5,541,667
Operating expenses	3,156,020	3,218,668
Net earnings from operation	$2,584,194	$2,322,999
Income from other sources	117,586	119,301
Gross income from all sources	$2,701,780	$2,442,300
Deductions from income	3,019,051	2,972,635
Net income	*$317,271	*$530,335

* Deficit.

LIMA & EASTERN FINANCED

The Lima-Eastern Electric Railway, which proposes to build a line connecting Lima, Kenton and Marion, a distance of 55 miles, will be financed by a syndicate of Cleveland and New York people. The negotiations on the part of the company have been in the hands of W. H. Wyke, general manager, and C. B. Shode, treasurer of the company. At a meeting held in Mansfield last week, the contract was entered into for the sale of the company's property, consisting of right of way, franchises, profiles, maps, etc. A meeting of the stockholders has been called to authorize the sale at the earliest possible moment. The F. S. Pease Engineering Company, of Cleveland, representing the Cleveland people, will have charge of the engineering work for the line.

STREET RAILWAY RIOTS IN BROOKLYN

On Saturday, Aug. 11, a decision was handed down by Justice Gaynor, of the Supreme Court, sitting in Brooklyn, in the case of a passenger from Coney Island who refused to pay a double fare, to the effect that the passenger was not "guilty of a breach of the peace in simply disputing the right of the conductor to make him pay a second fare. He had the right to refuse to pay it and is discharged." As a result of this decision many of the passengers to the Island on Sunday over the Brooklyn Rapid Transit and Coney Island & Brooklyn lines took it upon themselves to interpret the finding to mean that they would be justified in not paying the additional fare, which is collected in the outlying districts of the city, about 2½ miles from the Island, and a number did refuse to pay. These passengers were requested to leave the cars by the companies' special officers, and not complying complacently, were ejected. In a number of instances the passengers became unruly, and the aid of the police had to be secured to suppress the hoodlum element. These skirmishes with passengers interfered with traffic, and in the evening, when the 250,000 or more pleasure-seekers were returning home, a block resulted on the Brooklyn Rapid Transit lines which tied up traffic for more than 2 hours, and stalled the cars from Kensington to Coney Island, a distance of about 4 miles. Messrs. Smith, Dutton, Wood, Davis and Cooley, of the Brooklyn Rapid Transit, were all at the Kensington station in the evening, and Secretary and Treasurer Cannon, of the Coney Island & Brooklyn Company, was at Coney Island Avenue and Twenty-Second Avenue to direct the handling of traffic. The police seemed to be entirely at sea as to their authority in the matter, and when they did act complicated matters. This was instanced in their arrest of several Brooklyn Rapid Transit motormen, who refused to move their cars until the conductors had secured all the fares. Bird S. Coler, who was elected president of the borough of Brooklyn on the Municipal Ownership ticket, and who has been avowedly hostile to the Brooklyn Rapid Transit Company, was present at one of the points of disturbance, and urged the rioters not to pay the second fare. He has since given out several interviews in which he has stigmatized any one who paid a second nickel as only "half a man." The routes of the lines are all within the city limits, but the companies operate over leased lines organized and formerly run as steam railroads. On this it is that they base their right to the extra fare.

Col. Timothy S. Williams, vice-president of the Brooklyn City Railway Company, said in relation to the matter:

"We believe that we are fully within our rights in the matter. If there are persons who think that we are not entitled to the 10-cent fare, all that any one of these persons has to do is to take a train to Coney Island, go to the point where the extra fare is collected and there refuse to pay it. If that person then leaves the car and commences suit for the penalty of $50 prescribed by law, in addition to the fare lost, he then can test the law to his satisfaction—and to ours. We would welcome a suit of this kind in order to make the fact known that we are within the law absolutely clear to all.

"The persons who go down to the point where the second fare is collected, and there go about making a fuss do not proceed in the right way. They show that they are merely looking for trouble. That is not the way to accomplish a public good, which I am given to understand was the underlying object of Judge Gaynor's decision, rendered at 3:30 o'clock on Saturday afternoon, at about the time when the heaviest traffic to Coney Island is beginning.

"Under the law we are not limited to a charge of 10 cents for a ride to Coney Island. Where one railroad company takes a lease of another and runs the second road as a part of its complete system, it is entitled to charge what was the legal rate for a male adult passenger on that road. The steam railroads which we took over and converted to form a union with the electric system were entitled to charge 3 cents a mile. That would make the fare to Coney Island by steam road 18 cents. Add to that 5 cents for the electric part of the road in operation before the junction was effected with the steam road, and the total cost is 23 cents. Instead, we charge 10 cents, which is a little over half of what the steam roads used to charge.

"We could not possibly charge less than 10 cents and support the expenses of the road. However, as I have said, we would be only too glad to have a test case made of the charge, so as to set forth our charge as legal until such time as the law is changed."

The dispute between the Brooklyn Rapid Transit Company and those riding over its lines to Coney Island, who regard the 10-cent fare illegal, was cleared somewhat Wednesday by the company's promise to give rebate checks to those who pay the second fare. A test case will be taken to the Court of Appeals, and if the court decides that the railway company has no right to charge the 10-cent fare now demanded, each check will be redeemable by the company for a nickel. In case the court decides for the company's contention the checks will be valueless.

The sanest expression of editorial opinion that appeared in the Metropolitan press while the relations between the company and its patrons were strained, probably appeared in the New York "Times" on Wednesday morning. The gist of this opinion follows:

"Acting Mayor McGowan correctly describes President Coler as 'a great poser' and as a man who 'is inciting riot.' The course pursued by Sheriff Flaherty is entirely consistent with the policy adopted by the President of the Borough. With much propriety Judge Gaynor's remarks upon the double fare to Coney Island, delivered as an unnecessary addendum to a decision discharging a prisoner, have been criticised as untimely, superfluous, and ill-judged. His Honor's observations precipitated disgraceful and continued public disorder because of his failure, whether by intention or oversight, to say what he should have said, that the opinions he expressed were merely individual views and not an authoritative declaration of the law binding upon the company. He issued no order, the company was not concerned in the matter, and hence was powerless to appeal. No course was open to it but to continue the collection of its lawful fares, and to eject from its cars as disorderly persons those who refused to pay."

JOSEPH RAMSEY IN NEW YORK-CHICAGO PROJECT

The announcement was made on Wednesday that Joseph Ramsey, Jr., former president of the Wabash Railroad, and foreign capitalists are planning to build an electric railroad from New York to Chicago by way of Pittsburg. As a preliminary step in the furtherance of the project papers of consolidation are to be filed in Harrisburg within a few days of the Indiana, Clearfield & Eastern, the Allentown, Tamaqua & Ashland, and the Brush Creek & Crow's Run Railroads. It is intended to use the Lorain, Ashtabula & Southern, which is now approaching completion in Ohio, as a feeder for the new line. The Indiana, Clearfield & Eastern and Allentown, Tamaqua & Ashland Railroads form the main system in Pennsylvania. The Indiana, Clearfield & Eastern begins at Pittsburg and follows the Allegheny River up to a junction of that stream with the Kiskiminetas, opposite Freeport, and traces the Kiskiminetas up several miles to a point near Leechburg, where it crosses Crooked Creek, running up that stream through South Bend, Shelocta and Creekside. Thence it crosses the Black Lick Creek and crosses the Divide to the west branch of the Susquehanna River, which stream it spans at Cherry Tree. From there it passes through Westover, near Irvona, on the Bells Gap division of the Pennsylvania, through Beccaria, crossing the main Allegheny Mountains near Sandy Ridge. It is near this point that the Pennsylvania lines to Tyrone and Clearfield cross the Allegheny Mountains. The main line continues by way of Selins Grove, crossing the valley of the Susquehanna at that point. It thence strikes into the valley of Mahanoy Creek, and follows that stream through Ashland and Mahanoy, and tunnels Buck Mountain for a distance of 3000 ft. It then reaches Lizard Creek by way of Tamaqua, and the Blue Ridge is pierced by a tunnel 5000 ft. long to Jordan's Valley, which is traced on to Allentown on the Lehigh River. The road continues to Easton on the Delaware, the extreme Eastern point in the State. Several very short lines have been located through New Jersey, where the low ground makes easily possible a line into Jersey City. The total distance from Pittsburg to New York by the new line is 380 miles.

Joseph Ramsey is credited with the following signed statement relative to the new project:

"We expect to make a start this fall and begin work next spring, hoping to complete the line between Pittsburg and New York within three years. The cost of the line between Pittsburg and New York is estimated to be between $75,000,000 and $100,000,000, all of which has been pledged, the bulk of it by foreign capitalists. It would not be wise for me to give details or names now.

"The line is not merely a preliminary survey, but a final location that has been revised three times. Three corps have been busy for three years. It is the best possible short low-grade line to be secured through Pennsylvania between Pittsburg and New York. The extension of the road west to Chicago from Pittsburg will be taken up when the line east to New York is completed."

BOSTON ELEVATED PETITION TO BE CONSIDERED AUG. 20

The plans of the Boston Elevated Railway for the proposed extension through the West End have been formally filed with the city, and the petition of the company will come up before the Board of Aldermen at a public meeting on Aug. 20, and at some subsequent date will go to the Railroad Commissioner. The new route, as laid out in the plans, will traverse the city from the North Station to the Charles River dam, taking in entire blocks of brick tenements, crossing seven streets, but avoiding Leverett Street, the main highway of the West End. The plans show three interesting features, namely, a new elevated station in Causeway Street, where the new line will pass in front of the passenger terminal of the Boston & Maine Railroad; a two-way connection with the existing elevated railway at the corner of Canal and Causeway Streets, and an entire absence of curves except at the place where connection is made with the existing structure and at the place where the proposed line swings out of Causeway Street to make the long diagonal in the direction of the dam. What the plans are with reference to the present North Station stop on the elevated does not appear. Possibly the present station between Canal and Haverhill Streets will be left as it is, and the new one at the end of Friend Street used in connection with it. This new location is asked for by the railway company under authority given by the Cambridge Subway Act, passed last May. But that act did not name specifically any such route as has been proposed. The act said that the new line might go by way of Causeway, Lowell, Brighton and Leverett Streets, locations existing under the provisions of Chapter 548 of the Acts of 1894," the original elevated railway act; but it said further, that "for the curves" the extension might be made "in and over such other intervening public or private ways or lands" as the Mayor and Aldermen might approve.

ANNUAL REPORT CENTRAL PENNSYLVANIA TRACTION COMPANY

The annual report of President Musser, read at the recent annual stockholders' meeting of the Central Pennsylvania Traction Company, shows among other things an increase in gross receipts of $100,789 over the year previous. The gross receipts during the year ending June 30, 1906, were $640,356.14, and operating expenses $309,856.73, leaving the net earnings $330,999.41. Taxes and rentals amounted to $214,836.67, leaving surplus earnings of $116,162.73. The company carried 15,967,412 passengers during the year, and the company's mileage was 2,222,765, as compared with 2,021,976 the year previous. During the year just closed the company put in operation the line between this city and Hummelstown, and put down considerable double track, and now have 63.92 miles of single-track road in operation daily. The company expects to have the new power plant in South Harrisburg in operation by Oct. 15, 1906, when both the old Harrisburg and Steelton plants will be dismantled and the old machinery sold. The improvements at Paxtang Park include a swimming pool 50 ft. x 100 ft., and a boating lake, also a subway at the park entrance, which will be completed by Aug. 15, 1906. During the coming year the company will lay track on Cameron Street from Forster to the northern city limits; on Thirteenth Street to the eastern city limits; on North Street from Third to Capitol; and on Third Street from Walnut to North, the latter being a second track. These directors were elected to serve for three years: E. W. S. Parthemore, James Russ, Jr., William H. Seibert, F. Eugene Wolz and E. Z. Wallower. At a subsequent directors' meeting the present officers of the company were all re-elected.

IMPORTANT ILLINOIS ROAD FINANCED

A syndicate of leading bankers in Cleveland has undertaken the financing of the Chicago, Lake Shore & South Bend Railway Company, which was originally promoted by J. B. Hanna, F. B. McMillen, F. B. Wagner and others of Cleveland. The road will be one of the most important links in the chain of lines between New York and Chicago. The eastern terminus of the road will be South Bend, Ind. From there to Michigan City it will parallel the Lake Shore & Michigan Southern. Then it will run due west to the new town of Gary, which promises to become the most important steel producing center in the country, enormous plants being erected there by the Steel Corporation. From that point it will go to Indiana Harbor and thence to Kensington, on the outskirts of Chicago, from which point it is stated that the center of the city will be reached under an arrangement to utilize the tracks of the Illinois Central. The new line will serve a population of 250,000 outside of Chicago. The road will be built entirely on private right of way, except through cities where fifty-year franchises have been obtained. The construction will be of the highest order, with heavy rails and approved grade crossings, and with practically no grades or curves. It is expected that the road will be completed by Sept. 1, 1908.

ST. LOUIS CAR COMPANY TO BUILD AUTOS

The Kobusch Automobile Company, of St. Louis, will be absorbed by the St. Louis Car Company, and will be operated as a part of the car plant. Arrangements are now being made to merge the automobile company in the car company, and the management will soon be in a position to make an announcement that the absorption has been effected. As the St. Louis Car Company controls the stock of the Kobusch Automobile Company, George J. Kobusch being the dominant officer in both institutions, the merger will be accomplished without any difficulty. The automobile company was originally operated in connection with the car company, and the new arrangements practically will be to return to the initial organization. The automobile company manufactures the American Mors machine, for which it holds the American rights.

ST. LOUIS MERGER RATIFIED

The proposition of the management of the United Railways Company to merge the St. Louis & Suburban system, on the basis of an exchange of United Railways preferred stock for the stock of the St. Louis & Suburban Company, was ratified Wednesday, Aug. 8, by vote of the stockholders of the United Railways Company. The stockholders of the Suburban system met at the same hour, and voted to accept the offer of the United Railways Company. Most of the stockholders were represented by proxy. President Begg, of the United Railways Company, said that the amalgamation of the new system and the consequent issuance of transfers from one line to another may not be brought about for some time, perhaps for six months. The total stock issue of the United Railways Company, including common and preferred stock, is 378,970. Out of this number 321,705 shares were voted in favor of the consolidation, and 2650 shares against it. The Suburban stockholders cast 35,678 votes for the proposition. This represents 90 per cent of the entire stock issue of the Suburban Company.

INTERURBAN SERVICE FOR NEW HAVEN, MERIDEN AND MIDDLETOWN

The statement is made in New Haven that the city of Hartford will be given additional time in which to consider the application of the New York, New Haven & Hartford Railroad to lay T-rails in that city preparatory to the inauguration of an interurban service over its steam lines into the city, and that the company will devote its energies to perfecting arrangements for giving New Haven, Meriden and Middletown such a service, as none of these cities object to the use of the T-rail to a limited extent within corporate limits. Commenting on this situation the Hartford "Courant" says: "The opposition to this project has been incomprehensible to us from the start. It is utterly unlike Hartford. This is not a community that ordinarily wants to raise hay in Main Street, or that bases the value of real estate on the quiet of the locality. Looping New Haven, Meriden and Middletown will develop a large trade, and it will go away from instead of to Hartford. Our loss is their gain, as the tombstone poets sing; and we still have the dinky engine, the grooved rail and the satisfaction of turning down a great railroad's president. The other fellows get the business."

FOUR-TRACK LINE FROM BUFFALO TO NIAGARA

The Frontier Electric Railway Company has been organized as a subsidiary company of the International Railway Company, of Buffalo, to build a modern high-speed, double-track electric railway, mainly on its own right of way, from Buffalo to the entrance of the new bridge at Niagara, for which charters have already been obtained form the State of New York and the Dominion of Canada. Of the project President Pierce, of the International Company, is quoted as stating:

"It is proposed to double track the existing line between Lockport and Tonawanda, not only to take care of the ever-increasing traffic from Lockport to Buffalo and Niagara Falls, but also to provide for the very large increase in traffic which will immediately follow the completion of the electric railway now being constructed between Rochester, Brockport, Medina, Albion, Middleport and Lockport. The new railway company will also make connection at the new bridge at Niagara Falls with the fast electric railroad owned by the MacKenzie-Mann-Nicholls syndicate running from Toronto through Hamilton to Niagara Falls, the rights of way for which have been acquired and the contracts for the construction of which are now about to be let."

PROGRAM OF THE INTERNATIONAL STREET RAILWAY CONVENTION AT MILAN

The program of the convention at Milan of the Union Internationale de Tramways et de Chemins de fer d'inérêt local (Internationaler Strassenbahn und Kleinbahn-Verein) has just been published. It is as follows:

Sunday, Sept. 16, Evening.—Reception to delegates and ladies at the Bourse Salon, distribution of badges, etc.

Monday, Sept. 17, Morning.—Opening of convention by his honor the Minister of Public Works of Italy. Afternoon—Visit to various manufacturing establishments in Milan. Evening—Banquet to delegates, extended by the Italian Government.

Tuesday, Sept. 18, Morning.—Second session of the convention. Afternoon—Visit to the Exposition, with luncheon at the Belgian section, extended by the Belgian Commissioner General. Evening—Reception by the Italian Edison Electric Company and visit to its power station. At this meeting a paper will be presented on "Steam Turbines and Their Application to Electric Traction," by G. Semenza, of the Italian Edison Electric Company.

Wednesday, Sept. 19.—Excursion to Lake Maggiore and to Varese.

Thursday, Sept. 20, Morning.—Third session of the convention. Afternoon—Excursion to Pavia.

Friday, Sept. 21, Morning.—Fourth session of the convention. Afternoon—Excursion to Monza, stopping at Sesto S. Giovanni, to visit the manufacturing works at that place.

Saturday, Sept. 22.—A choice of two trips is offered, viz.: (1) to Bergamo and the Val Brembana, to inspect the Westinghouse single-phase road, or (2) to Sondrio and the Valtellina, to inspect the Ganz three-phase road. In the evening the delegates will be entertained at a banquet extended by the Municipality of Milan.

THE SITUATION IN CLEVELAND

In deciding the injunction suit over the right of the city to tear up the tracks of the Cleveland Electric Railway on Fulton Road, extended reference to which has been made in previous issues, Judge Lawrence, of the Common Pleas Court, gave a partial victory to the old company by deciding that the city had not acted in a legal manner in that the resolution calling upon the company to remove its tracks and the resolution instructing the Board of Public Service to do the work after ten days, had not been read before the Council on three different days, and that an action thus taken is absolutely void. He gave the company the right to restore its tracks, but added that if the Council later adopted the resolution in a legal way that the tracks would have to be moved, as he denied the contention of the company that it enjoyed vested rights in any particular part of the street, adding that the street was wide enough for two tracks. He denied a mandatory injunction requiring the city to restore the track at this time. The Forest City Company was restrained from laying another track on the street or doing any work whatever until further action had been taken by the Council. Both parties to the fight claim victory in this decision. The Forest City Company is now endeavoring to induce the old company to allow it to lay two tracks on the street for the joint use of both companies at terms most favorable to the old company, and the old company is still considering the matter.

In their advertisements in the daily papers the contending parties are having warm arguments as to the question of whether the old company, in case the new company builds its lines, will be compelled to exchange transfers. Upon this question practically hinges the whole matter of the advantages of the two propositions —3 cents fare or seven tickets for a quarter. President Andrews contends that the proposition is ridiculous; that his company cannot be compelled to exchange transfers under existing franchises. He points to the fact that the old lines owned by Mayor Johnson, both in Detroit and Cleveland, never exchanged transfers with other companies, and referred to the great confusion of systems in Chicago, Dayton and other large cities where there are several companies. Mayor Johnson reiterates that the company's best grants expire in three years, and that self-defense will oblige it to seek a transfer alliance with the so-called Municipal Company. Mr. Andrews has proved to the satisfaction of nearly every one that this is untrue.

A new wrinkle in the advertising compaign of the old company is the erection of large signboards in various parts of the company setting forth its arguments.

An entirely new angle has been created by the announcement, on Monday of this week, by Councilman Hitchens, who fathered the Cleveland Electric ordinance of seven tickets for a quarter, that he is now in favor of the Detroit plan of settlement (referred to in our last issue). In brief he says he will vote to bring before the vote of the people at the November election an ordinance requiring the company to give ten tickets for a quarter during the workingmen's hours of 6:30 to 8:30 a. m. and 4:30 to 6:30 p. m., with six tickets for a quarter and 5-cent cash fare during other hours, with universal transfers at all times. Nothing is said about a proportion of the gross receipts going to the city, which is a feature of the Detroit ordinance agreed upon. Hitchens now stands for a twenty-year franchise in place of the twenty-five-year grant called for in his original proposal.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED AUG. 7, 1906

827,710. Electric Tram Car; George J. Conaty, Smethwick, England. App. filed Oct. 17, 1904. Details of a car in which the axles, after having moved radially in passing around the track or curve are quickly brought back to their normal positions relatively to the car.

827,827. Rail-Bond; Charles R. Sturtevant, Mansfield, Ohio. App. filed Dec. 2, 1904. A terminal is provided on the rail-bond adapted to be applied to a rail or other part to be bonded, the surface of the terminal to be applied to the rail or other part having projections of uniform height whereby a uniform space is provided there between.

827,829. Trolley; George C. Thomas, New York, N. Y. App. filed Aug. 26, 1905. Rigid frames are provided on the trolley comprising casings, each casing having an inwardly projecting bearing lug on its depending lower portion, in connection with a bearing bar having a flat upper surface rigidly secured in said lugs to connect said casing, and forming an axially-located bearing surface, each casing having an angularly disposed ball race with a substantially straight lower portion, a facing for said lower portion, balls in said race, and a yoke having openings at either end to loosely engage said bearing bars.

827,880. Fluid Pressure Brake; Augustus Parker-Smith, New York, N. Y. App. filed Dec. 1, 1905. In a fluid pressure brake system for trolley and other cars there are employed, in connection with the brake levers of a main pressure cylinder and piston connected to said levers, a second cylinder and piston supplied with fluid under pressure from the first cylinder, means for connecting the piston of the second cylinder to the brake levers when said piston moves on its out stroke, a valve controlling the flow of air from the main cylinder to the second cylinder, which valve is set to open at a predetermined pressure and a check valve controlling the return flow of fluid from the second cylinder to the main cylinder.

827,947. Automatic Signal; William A. True, Rulo, Neb. App. filed Nov. 27, 1905. An alarm is located in proximity to the driver of the railway motor. In connection therewith a pivoted latch is

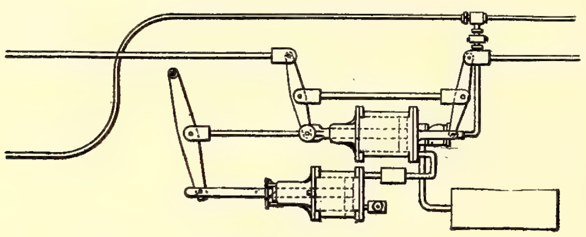
employed adapted to control the alarm, together with a rod mounted upon the motor, an extension projecting from the rod in such a manner as to actuate the latch, an arm pivoted to said rod for contacting with posts located at predetermined points along the roadbed, whereby the alarm may be sounded, and a spring for returning the rod to its normal position.

828,014. Electro-magnetic Railway Switch; Rollin A. Baldwin, South Norwalk, Conn. App. filed July 17, 1903. A railway switchpoint is positively reciprocated in both directions by means of a magnet, thus dispensing with the use of a spring which is commonly employed for moving the switchpoint in one direction.

827,977. Composition of Matter; Louis F. Johnson, Chicago, Ill. App. filed Jan. 10, 1906. The composition of matter covered by this patent is designed for use as a brake-shoe facing or insert, the same consisting of granulated cinder, asbestos pulp, salt, wood pulp, cement, sulphate of magnesia and creosote.

828,054. Track Mechanism for Railroad Crossings; John W. Renner, Cadillac, Mich. App. filed May 29, 1906. The rails terminate short of the points of crossing to provide passageways for the flanges of the car wheels, and a moveable splice bar or bridge element is located at each point of crossing common to two crossing rails, the same being designed to be automatically shifted to bridge the space between the ends of the rail at the time the rails are in service. The patent covers details of the mechanism for automatically shifting the bridge element and for shifting a signal arranged adjacent the crossing.

828,112. Car Replacer; Nicolas F. Hess, Atchison, Kan. App. filed April 18, 1906. The car replacer of this patent has a body portion gradually reduced in thickness in a forward direction, the tread surface of said body portion being provided with a vertically projecting flange adjacent to one edge thereof, and formed with a groove extending at an angle to the side edge of the tread portion and opening at its rear end to one side of the tread portion.



PATENT NO. 827,880

828,184. Railway Brake; Samuel Britton, Twilight, Pa. App. filed May 3, 1906. A friction brake is carried by the car, the same being used in connection with a continuous rack-bar and a toothed wheel arranged between the track rails and a train of gearing, together with a sprocket wheel for revolving a brake shaft and brake wheel carried thereby.

828,159. Brake-Shoe Fastening; Samuel Webb, Glassport, Pa. App. filed Jan. 10, 1906. The brake-shoe is provided with a lug, and has a key passing through said lug, the key having a hooked engagement at its ends with the ends of the brake head.

828,263. Switch Operating and Locking Device; Alfred Anderson, Detroit City, Minn. App. filed Nov. 21, 1905. Two rock shafts are employed, one designed for locking engagement with the switch bar, and the other provided with means for engaging the switch points, with a connection between said rock shafts whereby they will operate simultaneously.

PERSONAL MENTION

MR. W. W. S. BUTLER, of Grand Rapids, Mich., has been appaonted general manager of the Newport News & Old Point Railway & Electric Company, succeeding Mr. H. H. Carr, resigned.

MR. C. V. MILLS, superintendent of the Chester (Pa.) Traction Company, has resigned. Mr. Mills was in charge of the company's interests for two years.

MR. E. J. KOPPITZ, engineer for Westinghouse, Church, Kerr & Company, leaves this week for Rochester to superintend for that corporation the installation of the 11,000-volt single-phase railway being built for the Erie Railway between Rochester and Mt. Morris.

MR. E. B. JOHNS is to be superintendent of transportation of the new Norwich-Westerly Street Railway Company, having in charge the actual operation of the cars of the road and all that pertains to them. Mr. G. W. McClure will be the superintendent of motive power, in charge of the power house, etc. Both of these gentlemen come from the Michigan Union Traction Company, of Lansing, Mich.

MR. H. B. AINSWORTH, manager of the Los Angeles & Redondo Railway, and for twelve years with the company, has resigned, and is succeeded by Mr. C. H. Burnett. Mr. G. J. Kuhrts has been appointed chief engineer. Other appointments are Mr. C. O. Anderson, superintendent of the line department; Mr. L. O. Lieber, electrical engineer; Mr. C. A. Henderson, auditor; Mr. E. T. Cook, auditor of the Huntington-Redondo Company.

MR. ROBT. L. KELLY, chief engineer of the Florence Electric Street Railway, of Florence, Col., well known throughout the West, was struck by lightning near Raton, N. M., July 24, and instantly killed. Mr. Kelly was a native of Lebanon, Ky., and was 41 years old. He went West some time years ago, and did considerable important engineering work for the railroads, more especially the Denver & Rio Grande. At the time of his death he was locating a road eastward through a very mountainous section from Raton.

MR. J. W. HOLLIDAY has been appointed superintendent of the Montgomery Traction Company, to succeed Mr. C. C. Hogshead, resigned, who has gone to Lynchburg, Va., to take the position of superintendent of a gas plant owned by the same syndicate which owns the Montgomery Traction Company. Mr. Holliday, the new superintendent, was superintendent of the traction company when Mr. E. E. Winters was its general manager. In March, 1895, when the property of the traction company passed into the hands of the syndicate of which Mr. R. D. Apperson, of Lynchburg, is president, Mr. Holliday was retained by the syndicate, and has since that time had charge of overhead work of the Montgomery Traction Company.

MR. D. A. HEGARTY has resigned as general superintendent and chief engineer of Railways Company General, and accepted a position as general manager and treasurer of the Little Rock Railway & Electric Company, of Little Rock, Ark. He entered upon his duties Aug. 1. Mr. Hegarty entered the electric railway field after six years service as assistant engineer of construction on the Pennsylvania Railroad, becoming associated with Mr. A. Langstaff Johnston in the construction and installation of various properties throughout the country. After acting as chief engineer of construction of Hestonville, Mantua & Fairmount Railway, of Philadelphia, he became general superintendent and chief engineer of that company, remaining until the consolidation with the Union Traction Company. Then he resigned to become general superintendent of the Norfolk & Ocean View Railway, of Norfolk, Va., and later accepted the position of general superintendent and chief engineer of the Railways Company General, having charge of all operation and construction of different properties owned and controlled by it. No successor to Mr. Hegarty will be appointed, as the Railways Company General is retiring from the operating and constructing field.

MR. NORMAN McD. CRAWFORD, of Hartford, Conn., formerly general manager of the Hartford Street Railway Company, has returned from England, where he has been for the past six months investigating the condition of street railways for the committee on public ownership and operation of the National Civic Federation. The experts employed by the committee were Mr. Norman McD. Crawford, who with Mr. J. G. Woodward, of the engineering firm of Preece & Carew, of London, investigated the street railways; Mr. J. B. Klump, of Philadelphia, and Mr. William Newbigging, of Manchester, England, who investigated the gas companies; Commissioner Albert E. Winchester, of South Norwalk, and Mr. J. B. Klump, electric lighting. Mr. R. C. James, of Philadelphia, and Mr. E. H. Turner, of Manchester, England, expert accountants, examined the financial conditions of the various corporations and companies, and Prof. J. B. Commons, of the University of Wisconsin, and Commissioner J. W. Sullivan, of New York, examined the labor conditions. Mr. Crawford, in company with his English associate, Mr. J. G. Woodward, examined the Dublin United Tramways and the street railways of Glasgow, Liverpool, Manchester, Norwich, the London County Council, and the London United. The Dublin, Norwich and the London United Companies were private concerns, but the others are railways operated by the municipalities.

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 277,600 copies, an average of 8164 copies per week.

Street Railway Riots in Brooklyn

A most remarkable condition of affairs was sprung upon the street railway management and people of the City of Churches on Sunday, Aug. 12, and continued in an acute form during the greater part of last week. It has now gradually subsided, partly as the result of a slight concession on the part of the Brooklyn Rapid Transit Company, but principally because the nominal reason for the disturbance of the public peace was removed by what may be termed a reversal of a judicial decision which never was rendered. If anything could exhibit a greater disregard of law and order in a usually well-regulated community than was encouraged last week by the municipal authorities of Brooklyn and was offered by the disorderly and misguided individuals who followed their advice, we do not remember it. The results would have been amusing if they had not been so serious, and are certainly worthy of the imagination of a De Koven or a Gilbert. Any reproduction on the stage would be regarded as preposterous. Imagine, if possible, passengers declining to pay their fares but holding on to their seats like grim death; employees of the railway company forbidden by law to assault the passengers but trying to loosen their hold on the seat arms; the president and sheriff of the borough shouting to the passengers to hold on tight and denouncing anyone who paid his fare as "only half a man"; the police standing by to see that no one was hurt in the scrimmage; and finally, the orderly passengers held in long lines of cars because the law said, or was understood to have said, that a passenger could not be assaulted or arrested for refusing to pay his fare. We fail to see why such a passenger stands in any better legal position than an ordinary trespasser, or why during the controversy police protection should not be given to the railway company as it would be to the merchant or hotel keeper whose customers insisted upon taking his goods or eating his meals without paying for them. We have no doubt that the statement made by the late candidate for Mayor on the Municipal Ownership ticket of New York, that under municipal ownership the electric lines would carry passengers from the Bridge to Coney Island for 5 cents, is true. If the demands of "the people" were loud enough the fare under such a regime would undoubtedly be cut to 3 cents, or passengers might even be carried for nothing. Such a policy would prove very popular with Mr. Hearst's constituents. The great mass of them pay no taxes, at least directly, and a deficit in the city's income accounts would cause them no present anxiety.

The management of the Brooklyn Rapid Transit Company undoubtedly acted wisely in compromising on the five-cent rebate ticket and in offering to hasten the adjudication of the legal point in question. But in the meantime the company is collecting its full ten-cent fare. The incident throws an interesting side-light upon the disregard for property rights which appears to be a popular phase of the new political economy. Mob rule, however, is not always successful, and we sincerely trust that that portion of the population which was innocently led into riotous proceedings by their counselors in the Brooklyn City Hall and newspaper offices on Park Row, New York, will hereafter accept the advice of these would-be leaders of public opinion at their true worth.

Compound Motors in Repair Shops

Until very recently machine tool driving in electric railway repair shops has been almost entirely accomplished by series or shunt motors operating at trolley voltage. In the early shops the practice of utilizing an old street car motor for the driving of tools on the group plan was almost universal, but the inefficiency and lack of flexibility of this method have led to the adoption of regular shunt motors for tool operation in the later and more modern shop installations.

Thus far the repair shop drive most in evidence is the group method, but with the larger work which is coming on interurban and electrified steam railroads, direct-connected tools are sure to be specified in many installations. We have already pointed out the special field of usefulness of the direct drive in the repair shop, which, in brief, consists of the heavier tool operations where the idle losses are relatively high, the continuity of service a fractional part of the elapsed shop time, and the necessity of regulated and forced production imperative.

With the increase of individual driving comes the question of the type of motor best suited to the work in hand. The series motor, as every one knows, is particularly adapted to service requiring variable torque and variable speed. Hence its universal use on cars and its almost exclusive possession of the crane and hoist. The shunt motor stands for constant speed within pretty wide limits of load, and it is especially qualified for group driving or for individual driving where the speed variation required is practically negligible. The compound wound motor has thus far been very little used in street railway shops, but it is decidedly worth while to consider it in cases where large work is anticipated. Closely associated with the compound motor is the auxiliary or interpole machine, which has been coming to the front so rapidly during the past year or two.

The compound motor occupies half-way ground between the ordinary series and shunt motors, and according as the series or the shunt winding predominates it may be expected to conform more or less closely to the particular creed of performance represented by the plain series or the shunt motor. A wide range of service possibilities lie at the hand of the compound motor designer. In comparison with the straight series machine the speed of the compound motor varies less with a given change of load; whereas the speed variation as compared with the ordinary shunt machine is greater with the compound. A larger current is needed for a given starting torque in the case of the compound as contrasted with a series motor, and the former reaches its maximum torque more quickly. On the other hand, the compound motor will give a greater torque per ampere than the shunt type, other things being equal. Unlike the straight series motor, the compound can not run away and tear itself to pieces if the load is taken off suddenly, for the shunt winding holds down the maximum speed when running idle. The greatest usefulness of the series winding seems to be to provide a powerful starting torque at full rating or overloads. When designed by a reliable manufacturer, a compound motor will move the load under very severe conditions without injury to itself. A substantial fly-wheel can sometimes be included in the outfit to advantage. Heavy planers, shapers, punches, shears, saws and other tools requiring great power for short intervals are particularly favorable subjects for compound motor drives on the individual plan of connection, as are certain hoists where a wide speed variation is not essential. The inter-pole type of motor also supplies many of the advantages of the simple compound, particularly as regards heavy starting torque, together with a wide range of speed control and sparkless reversal in types designed for severe intermittent variable speed work. The forcing of production by the use of special tool steels and the employment of heavier tools and faster speeds will certainly require a more extended use of the compound motor in the repair shops of the near future.

A Word of Caution

The usual crop of summer trolley accidents is in harvest and the same old explanations are in evidence. The brakes wouldn't work and the trolley came off, and the motorman disobeyed orders. Now, there are accidents of a nature that no human foresight can avert and for which no one is properly responsible, but they are very few. Get to the bottom of the facts and you will usually find that something got out of order through somebody's carelessness, or that someone who should have known better took unjustifiable chances. The fundamental fact at the root of most trolley accidents is the attempt to do a land-office business on a single track without proper safeguards. The temptation in this direction is strong, for during a large part of the year cars are running on long headway with light loads, and the most rudimentary precautions suffice. For three months in the year business is rushing and quite outgrows the methods in use. If a road has to do, as often happens on interurban lines, fast and heavy passenger traffic over a single track, it must abandon once and for all the methods of a 4-mile-an-hour horse car line and run its cars on an absolute schedule with a proper system of train despatching. No half-way methods will answer. If two cars are scheduled to meet at a certain switch they must either meet there or at some other point predetermined. Accidents come from one car leaving a siding without getting in touch with the car it is expected to meet. Telephones are cheap, and rigid discipline rigidly enforced will do the rest.

Orders are often relaxed on the supposition that time will thereby be saved, while in point of fact time is lost by permissive schedules. If car A and car B are to meet at siding 1, the car that gets there first should wait until it gets definite and positive information as to where its mate is, either by its arrival or by a message locating it. If, by negligence, it goes ahead, the chances are that it will either cause a collision or that one car or the other will have to back to a siding, thereby losing time for both. The more cars on the system the more necessary is this orderly procedure. A very simple system of line telephones will enable train despatching to go forward smoothly and regularly. It is only necessary to follow the ordinary methods that have been adopted as a result of bitter experience on single-track steam railroads. As to accidents from rear-end collisions, interurban roads at times run on headway that is necessarily short. If, however, a definite rule is in force requiring a space of at least a certain number of poles between cars, say twice the space necessary for a stop, it will be difficult to get a collision. At the present high speeds, such rules should be most rigidly adhered to if they are to be effective. Permissive running is always risky and if done at all should only be in case of a breakdown somewhere, and even then only at greatly reduced speed. The distance, in poles, required for a car to stop on any part of the road ought to be definitely ascertained and should be as familiar to the motorman as the steps on his controller, and

the spacing of the cars should be set with a good margin beyond this distance. Electric roads have at times to meet sudden exigencies of traffic and run on short headway. This can be done safely only by working on a fixed routine and keeping cars under complete control. Nothing short of regular system will answer. The "Pass number 23 at Banger's siding, and if she ain't there, slip on kind of easy and try it at the crossroads" style of train despatching is responsible for a good share of the collisions. As to brakes failing and the like, the truth in two cases out of three is that the brakes have worked as well as they ever did, but the car was running fast and the motorman underestimated the distance required for a stop. Eliminate making sidings by guess work and ignorance of the real braking distance of the cars and you have cut down the chances of accident very greatly. For the rest, extra care in inspection of track and rolling stock will do something, but, as a rule, inspection in these days is pretty good. Failure to retire a car requiring repairs on account of rush of traffic is occasionally responsible for trouble. Beyond all this there are unaccountable failures which no reasonable caution can avert. Most accidents, however, come in the season of rush traffic and are connected with it in the various ways which we have here tried to indicate.

The Program and Papers of the Columbus Convention

The detailed program of the Columbus Convention is published in this week's issue of the Street Railway Journal, and is an excellent one. It has been carefully thought out, is arranged systematically, and indicates that the annual meetings of the association will be of more value to its members than they have been for many years past. This remark applies particularly to the American Street & Interurban Railway Association, but a glance over the programs of the Accountants' and Engineering Associations discloses lists of topics and speakers which are a credit to the executive committees of these organizations. The Claim Agents' Association has not been in existence long enough to establish a precedent, but the papers and subjects selected for its Columbus meeting seem to be of a character which should be of great assistance in solving the problems which arise in that branch of railway service.

The reports of the committees of the American Association which are scheduled for Wednesday afternoon should, and undoubtedly will, constitute a very important portion of the active work of the association during the Columbus Convention. While all of the subjects are important, we are looking with special interest to the reports of the committees on standardization of equipment and promotion of traffic. The former is on a subject upon which both the American and Engineering Association committees have been actively at work during the present summer, and the report scheduled for Wednesday afternoon will undoubtedly summarize the findings of the corresponding and co-related committee of the Engineering Association which reports to that association on the previous day. Certain of the topics to be considered by this committee have already been outlined in these columns, and the recommendations to be submitted should command attention. As this is a standing committee, the action taken at Columbus will undoubtedly be, not only upon the work already accomplished, but will direct attention to those branches of electric railway equipment which, in the opinion of the association, most demand the attention of the committee during the coming year. The promotion of traffic is of necessity one of the most vital topics which can be considered by a street railway association, as it relates directly to the best method of increasing the gross receipts, and suggestions upon this subject by practical managers should be welcomed. It is understood that this committee has been very active in securing data, and a great deal of valuable information should be secured.

The "Interurban Meeting" on Thursday includes the report of the committee on heavy electric railways, as well as six papers relating to different branches of interurban railway construction and operation. The first paper is on elevated railways and can properly be classed, we presume, as an interurban paper, owing to the tendency in some cities for interurban roads to use elevated railways in connection with their city termini. All of the papers in this section are by authors who have given special attention to the subjects to be discussed by them, and should be of the greatest value.

The "Employees' Meeting," which is scheduled for Thursday afternoon, will be opened by a report of the committee on rules, in which it is understood the rules for high-speed traffic will be taken up in a more thorough manner than ever before. The other topics to be considered during this meeting relate to the selection and discipline of trainmen, and suitable clothing for their minds and bodies.

In the executive session the principal topics to be discussed are municipal ownership and the relations of the companies to the public and to its own employees. Upon these points a great deal can be said.

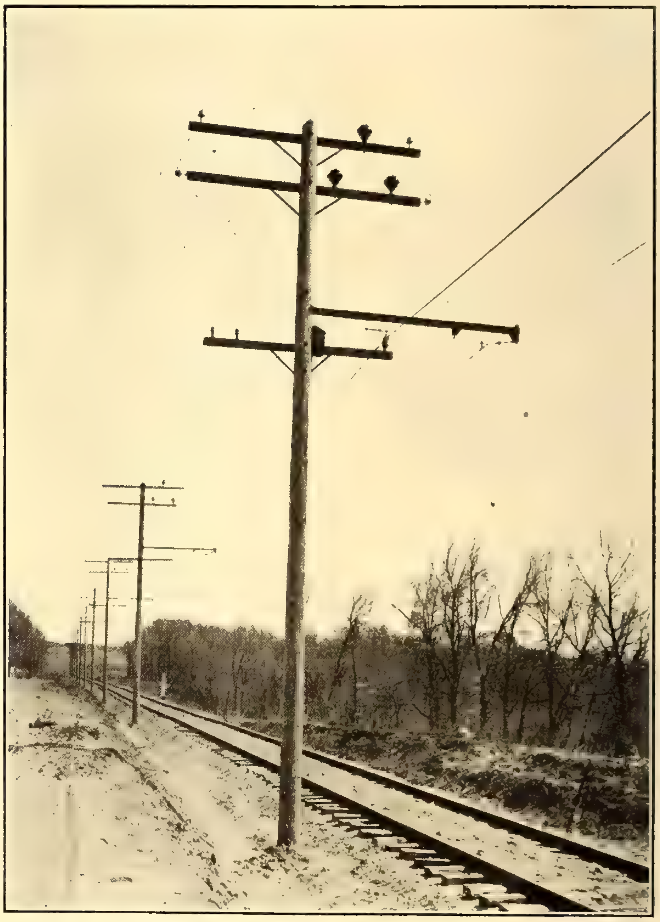
We shall not attempt to review the programs announced by the secretaries of the affiliated associations, except to call attention to the fact that the topics selected are most interesting and the assignments to them excellent. While all of the papers will be of value, we are looking forward with especial interest to the discussion on depreciation by the Accountants' Association; the report of the experience with gas engines in Boston, to be considered by the Engineering Association, and to the relation of statistical bureaus to the claim agents' work, which will be taken up by the Claim Agents at their meeting on Oct. 16.

A review of the program of the Columbus Convention would not be complete without a word in regard to the exhibits. For many years past there has been a gradual increase in the attention given by both manufacturers and delegates to this portion of the annual gatherings, and to many street railway managers and engineers it has been one of the principal, if not the principal, reason for attending. At no other one place or time during the year is it possible to obtain so comprehensive and accurate an idea of the progress made in the apparatus and appliances used in electric railway service. The conditions this year at Columbus for an exhibit are more favorable than ever before. Not only are the buildings at the State Fair Grounds eminently suited for the exhibition of apparatus of all kinds, but the space is practically unlimited. For this reason more manufacturers than ever are intending to be represented. The past year has been one during which many advances have been made in electric railway science, and attendants at the convention may be assured that in addition to the excellent program for the sessions of the different conventions, mentioned above, they will have an opportunity of inspecting the finest exhibit of street railway apparatus which has ever been held.

CONSTRUCTION WORK ON THE INTER-URBAN RAILWAY, DES MOINES, IOWA

In the past few years interurban railway construction has been gradually approaching that of steam roads, but in the case of the Beaver Valley division of the Inter-Urban Railway, Des Moines, Ia., it would be more exact to say that steam-road practice has been followed rather than approached. In fact in every particular the roadbed has been built in conformity with steam-road practice. The responsibility for such construction rests primarily upon H. H. Polk, president and general manager of the system, through whose courtesy the main constructive features of the line are here presented, but the thorough manner in which the details, so far as steam-road practice is concerned, have been carried out, is largely due to the fact that Frank S. Cummins, chief engineer of the road, was formerly associated with a steam road. The older lines of the Inter-Urban Railway were described at some length in the STREET RAILWAY JOURNAL for June 20, 1903. The Beaver Valley division, which is now completed and in operation as far as Granger, about 18 miles northwest of Des Moines, will continue in a northwesterly direction to Moran Junction, 6 miles beyond Granger, and at this point will branch in a northern and western direction. The branch going west will terminate at Perry, 35 miles distant, and the northern line will reach Woodward, 27 miles from Des Moines. Construction work on these extensions is well under way and the line will be in operation to Woodward and to Perry in a short time. The whole line has been built for freight as well as for passenger traffic, as at the present time about 30 per cent of the receipts of the railway system are derived from freight traffic. This contemplated use of the line, together with the fact that a high-speed passenger service will be inaugurated, necessitated construction heavier than that demanded by the average interurban road. This line is constructed on private right of way 100 ft. wide throughout its entire length, and through towns a right of way has been secured wide enough to permit of laying out freight yards at some future time. The steepest grade on the line, which is on the Woodward Branch, is 1 per cent. Except in the city of Des Moines, all curves are of such radius that cars can be operated around them at full speed. A three-degree curve is the smallest encountered. The road is in fact a series of long tangents connected by curves of one or two degrees radius. The track is laid with 80-lb. rails, and bonds soldered to the ball of the rail are used. The switches employed and the switch stands as well are the same as used in the best steam-road construction, the points of the switches being 15 ft. long and tied together with four tie rods. At frequent intervals along the line racks are provided for the support of extra rails in the same manner as is customary on steam lines. Underneath the ties is placed 6 ins. of gravel ballast obtained from the company's pits in the outskirts of Des Moines.

CONSTRUCTION AT CURVES

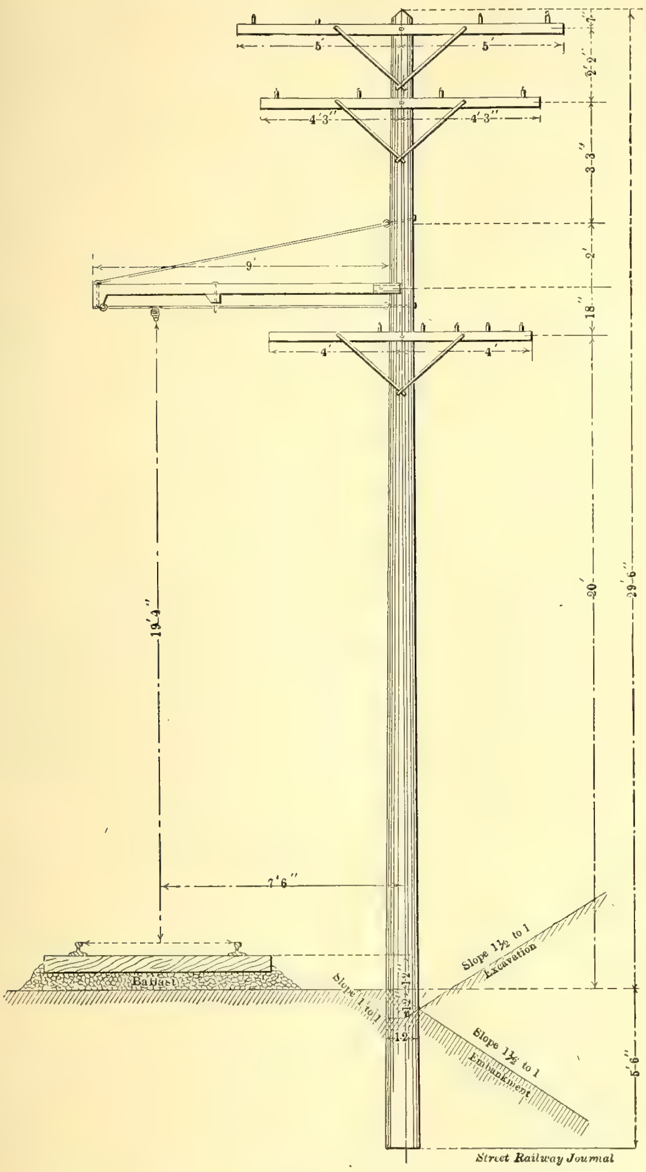


ONE OF THE SPECIAL POLES PLACED EVERY 1000 FT., UPON WHICH LIGHTNING ARRESTERS ARE GROUNDED, TROLLEY FEED-IN TAPS ARE MADE, AND THE HIGH-TENSION GROUND WIRES RUN TO EARTH

The line passes through comparatively level country and no excessive grading was encountered. However, several large bridges are passed over, the largest of which are at the two points where the line crosses the Des Moines River in and near the city of Des Moines. These bridges, which are of steel construction, are each about 500 ft. long and rest on cylindrical concrete piers incased in sheet steel. One of the bridges was purchased from the Santa Fe Railway and was originally built for this road. The wood trestles are of standard steam-road construction. The largest, that over the Beaver Creek, is 300 ft. long.

OVERHEAD CONSTRUCTION

In the design and construction of the pole line and overhead, E. R. Cunningham, electrical engineer of the system, has followed original ideas and others that are departures from the usual practice. Bracket construction is employed

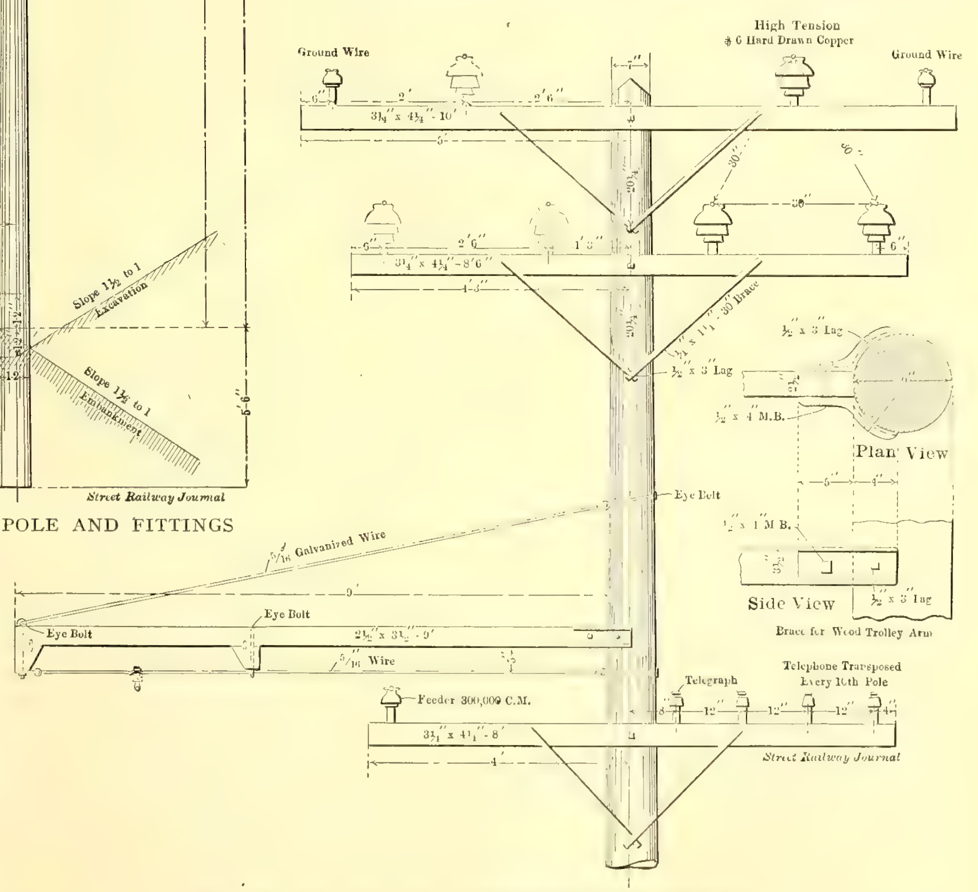


SECTIONAL VIEW OF ROADBED, POLE AND FITTINGS

throughout the length of the line. One of the accompanying drawings shows the position of the several circuits on the poles. Each of the poles, which are 35 ft. long and have 12-in. butts, carries in addition to the bracket three cross-arms. The two upper arms near the top of the pole are reserved for high-tension lines and the ground wires protecting these. The third cross-arm is located just below the trolley arm and carries the telephone lines and the feeder, and space is also reserved for telegraph lines. The trolley arm, as may be observed in the drawing, consists of a piece of wood measuring 3½ x 2½ ins. x 9 ft. long. It is fastened to the pole by two braces which encircle half the pole and prevent the arm from being twisted sidewise. The outer end of the trolley arm is supported by a 5-16-in. galvanized iron wire bolted to the pole a few feet above the trolley arm support. In the construction of the line the trolley arms and cross-arms were bolted to the poles while they were lying on the ground, and afterward the poles were raised in position with the aid of a 22-ft. boom mounted on a small push car. A derailing device for the push car was so built that the car could easily be run off the track to clear it for the construction train hauled by a steam locomotive, which was operated continuously over the track while construction work was going on. The poles were placed opposite the 100-ft. station stakes used by the engineers in aligning the track, and were lined up 7 feet from the center of these stakes by means of a device which permitted this to be done in a minimum amount of time. While the method of construction, that of placing all arms on the pole before its erection, was necessarily followed in order to cause less interference with the construction trains, it was found that not so much time was required to bolt the arms on when the pole was lying on the ground and to set the pole in position as is usually required simply to put the arms on after the pole is raised. The saving in time by the method was therefore the time necessary to raise the poles.

HIGH-TENSION LINES

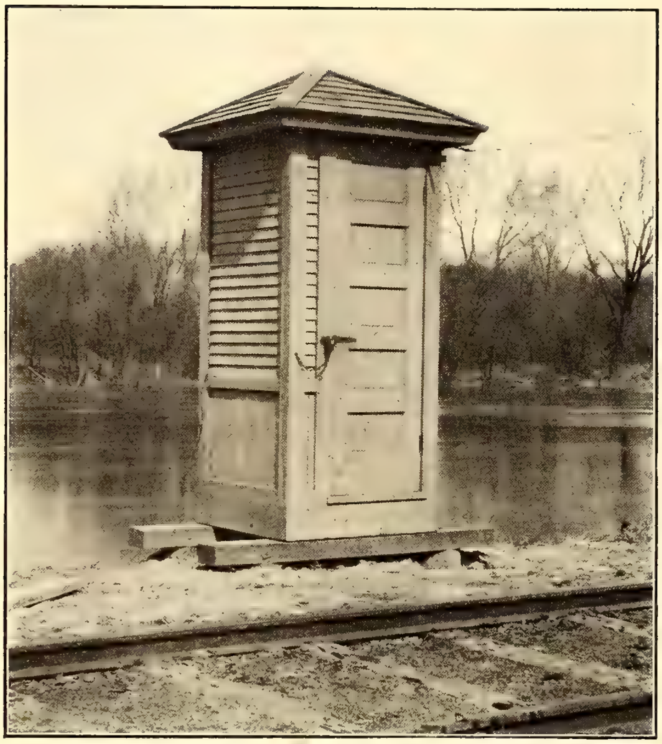
On the top cross-arm provision is made for two three-phase high-tension lines, but at the present time but one of these lines is in position. This consists of No. 6 hard-drawn copper wires supported on Locke No. 411 triple petticoat porcelain insulators with porcelain sleeves extending to the



DETAILS OF POLE AND BRACKET CONSTRUCTION

cross-arms and intended for a 40,000-volt line. In the past, considerable trouble has been experienced from lightning. To guard against this, the ground wires previously referred to are run on each end of the upper cross-arm. These consist of No. 6 iron wire and are grounded at every tenth pole by a lead which passes to the earth alongside the pole and terminates in a 10-ft. rod driven into the ground. The ground

wires are tied to the porcelain insulators supporting them in such a manner that the ends of the tie wires or "pig-tails" are twisted together and are pointed upward to serve as discharging points. The high-tension wires are tied without this upward projecting end. Those poles at which the ground wires are run to the earth are termed special poles. One of the accompanying reproductions from a photograph shows one of these poles and the method of bringing the taps from each of the ground wires over insulators on the ends of the cross-arm and immediately below the top one and together on the pole. A view of the special pole referred to shows a

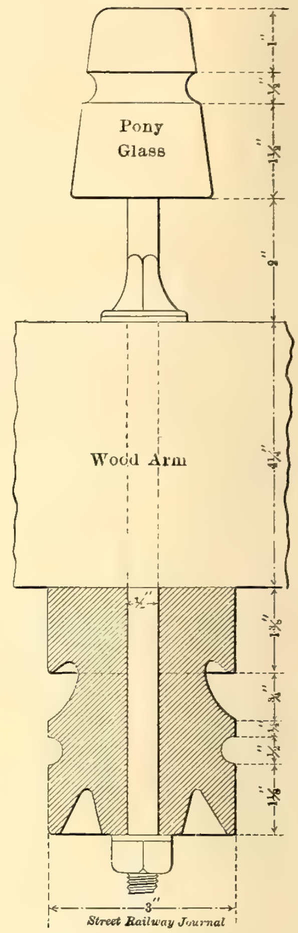


TYPE OF TELEPHONE BOOTH

lightning arrester mounted upon the pole just behind the lower cross-arm. As the arresters are placed on every special pole, and such poles are placed at 1000-ft. intervals, there are about five of them to the mile. The 300,000 circ. mil stranded aluminum feeder cable which extends through the length of the line is placed on the end of the lower cross-arm nearest the trolley wire. The supporting porcelain insulator brings the feeder to the same height as the trolley wire and immediately underneath the wire supporting the trolley hanger. The feeder is tapped in on the trolley wire at every special pole. At these points the trolley is supported by Syracuse feed-in hangers and a wood strain insulator is placed in the supporting wire near the point where it is bolted to the pole. But a very short connecting wire is therefore required between the feeder and the supporting wire of the trolley. One object in putting the feeder on the trolley side of the pole and out near the end was to facilitate the work of placing it in position. This permitted the feeder to be strung from a reel on a car in the same manner that a trolley wire is usually placed in position, and it was possible to string about 3 miles of feeder a day with one car. The telephone circuits are of No. 9 wire and are placed on the lower cross-arm at the extreme outer end. At every tenth pole they are transposed by a method somewhat out of the ordinary. The right-hand wire drops to a special insulator underneath the cross-arm, while the left-hand wire passes over to the right side. At the next pole the wire from the insulator is carried to the left side. The insulator used underneath the cross-arm is provided with a double petticoat and was designed by Mr. Cunningham especially for this work.

In bracket-line construction, it is usually the custom to use a single line pole at curves, and to place these on the outside of the curves. In this work, however, the poles carrying the high-tension wires, feeder and telephone wires continue on one side of the track throughout the length of the line. At the curves, where the regular poles come on the inside, the construction shown in one of the illustrations on page 286 is used. A second line, consisting of 30-ft poles placed opposite those of the regular line, carries the trolley brackets, and the taller poles are braced up by guy-wires across to the tops of the shorter ones. Each one of these in turn is guyed to an anchorage in the ground.

The method of construction permitted all the wires to occupy one position on the pole with reference to the track throughout the length of the line, and one specific advantage of this was that the feeder was always carried in a position that permitted it to be strung up with greater facility. In order to have poles near at hand in case of failure of any of them, at intervals of five miles two poles are carried on a rack at the side of the track.



TELEPHONE TRANSPOSITION, SHOWING SPECIAL INSULATORS UNDER CROSS-ARM

HIGH-TENSION WIRES ENTERING HERROLL SUB-STATION

One of the illustrations shows the type of telephone booth used along the line, and in which a permanent telephone is housed. Permanently installed telephones are preferred to portable sets carried on cars, for the reason that they are

more reliable and that the expense of maintenance is much smaller. While there is nothing elaborate about the construction of the booths, they have been so designed as to harmonize with the stations at towns and other of the company's buildings along the line.

Quite a number of farmers' telephone lines and other wires cross the right of way of the railway company. To avoid the possibility of trouble from crosses with the trolley or high-tension wires, these have been carried under the track in lead conduit.

Steam-road practice has been imitated closely in the matter of warning signs. Thirty-two different kinds of signs are employed. These embrace 1000-ft. markers, 100-ft. stop signs, highway crossing signs, station signs and others usually found on steam roads.

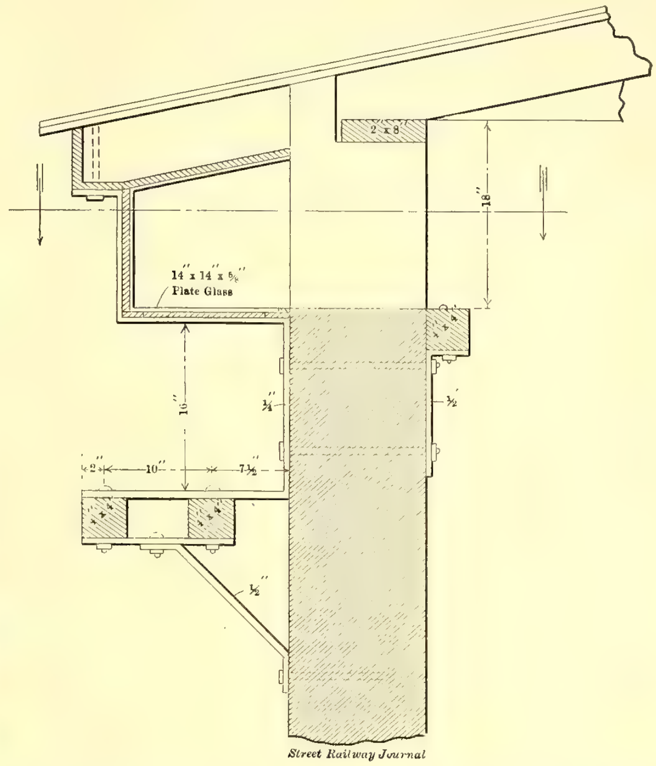
POWER HOUSE AND SUB-STATIONS

In addition to some smaller belted units, the power house contains two 1000-kw direct-current generators and an inverted 300-kw rotary converter for furnishing alternating current to the high-tension line. It is the intention to replace the belted machinery with large direct-connected a. c. apparatus. As the 300-kw rotary converter will not be of sufficient capacity to supply the sub-stations to be built, a rotary of 750-kw capacity is now being installed, and this, after the contemplated a. c. generators are in place, will be floated on the system between the alternating and the direct-current machines. The rotary converter in the power house supplies air-blast transformers which step the current up to 22,500 volts, and this is transmitted to the sub-station at Herrold, which is the only one in operation on the new division at the present time. The building housing this sub-station measures 34 ft. 2 in. x 28 ft. 2 in., and is of brick. The roof is supported on steel trusswork and consists of concrete reinforced by expanded metal and covered with 5-ply felt and gravel.

THE STATION AT GRANGER

PRESENT SUB-STATION BUILDING AND STATION AT HERROLD

The high-tension wires pass into the building and out again on the other side to continue to the sub-stations to be built beyond. The lower right-hand illustration on the opposite page shows the method of bringing these wires into the building.



EAST SECTION OF CONSTRUCTION, PASSENGER AND FREIGHT DEPOT AND SUB-STATION, DES MOINES CONSTRUCTION

The Herrold sub-station building, as it stands, is only the rear portion of the building that will eventually be erected at this point. Plans contemplate rooms for a passenger waiting room, offices and freight room in the front of the building. At the present time, a temporary partition separates the front from the rear portion of the building, and the forward portion is used as a waiting room and for freight. The sub-station machinery in the rear consists of one 300-kw General Electric rotary converter, air-blast transformers, and the necessary disconnecting switches, lightning arresters and switchboards, all installed in one room. On the completion of the building an additional 300-kw converter with necessary

TWO OF THE NEW 50-TON CARS

auxiliary apparatus will be installed here. Plans provide for another sub-station of 300-kw capacity at Moran Junction, another of similar capacity beyond, and also at Perry.

STATIONS

In their construction the stations at the principal towns follow steam-road practice. Three styles of buildings are employed. One is a combined sub-station, passenger and freight station, and this type will ultimately be erected at Herrold and other points where sub-stations are located. The second style of station is one built for passengers and freight. The offices are located in the middle of the building. A waiting room takes up one end, while the other is used for the storage of freight. A separate waiting room is provided for ladies.

The third type of station is that built at Granger and shown in one of the accompanying illustrations. It contains a

MANNER OF COUPLING CARS, THE SPRING BUFFERS AND PROTECTING ARM RAIL PERMITTING PASSAGE BETWEEN THE CARS

freight room in one end, waiting room in the other, and an office between. The interiors of the stations are finished in Georgia pine stained mission or black. The seats are of oak and are stained in a similar manner, and the floors are of hardwood. A ceiled wainscoting extends around the rooms to a height of 5 ft. from the floor, and other than for this the walls and ceiling are plastered.

YARDS IN TOWNS

At a convenient point in each of the principal towns for a distance of several hundred feet the right of way has been secured 150 ft. wide. On one portion of each of these strips yards will be laid out after plans which have already been drawn up. These contemplate a passenger and freight station, stock yards, corn cribs, and other conveniences for caring for freight and shipping farm produce. The remainder of the strips will be reserved for the erection of grain elevators, commission warehouses, and for sites for other enterprises which ship considerable produce.

NEW PASSENGER EQUIPMENT

Recently eight new passenger cars, which were described at some length in the Street Railway Journal for Feb. 3, 1906, have been built by the American Car Company, of St. Louis. They are equipped for multiple-unit operation, and are provided with buffers and end doors so that it is possible to pass from one car direct to another. An accompanying illustration shows the buffers and the manner in which the cars are brought together. The arm rails shown are hooked across the door of each car when the ends are not coupled together, and serve to protect the doorway. Two sets of drawbars are provided. Those of the M. C. B. type are ordinarily used, but in passing into Des Moines several short curves necessitate these being uncoupled and the cars connected by means of the lower draw bars which allow the cars to be coupled with sufficient space between them to take the curves. The interior finish is old oak, and the bodies are painted an olive green and are comparatively free from striping or decorations. Each of the Brill 27-E-2 trucks upon which the car is mounted, together with the two GE 73 motors on it, weighs 8 tons. The car itself weighs about 50 tons and is provided with Westinghouse graduated release air equipments and General Electric type-M control.

THE OVERHEAD CONSTRUCTION OF THE ROCHESTER & MOUNT MORRIS BRANCH OF THE ERIE RAILROAD

A description of the cars to be used on the 11,000-volt, single-phase line of the Erie Railroad between Rochester and Mount Morris, now being constructed by Westinghouse, Church, Kerr & Co., was published in the Street Railway Journal for July 14. Construction has now been commenced on the overhead line, which is to be a single-phase catenary mounted on wooden bracket poles on the main line, and on steel poles with span construction in the yards. The trolley wire is to be No. 000, carried on a single seven-strand, 7-16-in. galvanized steel messenger cable, which is to be painted. The messenger cable is tested for 22,500 lbs. The verticals which support the trolley wire from the messenger cable are spaced 10 ft. apart, and consist of ⅝-in. rods. The drop-forged hangers are made by the Electric Railway Equipment Company of Chicago. The ears which grip the trolley and messenger cable are identical except in the type of jaw. There will be six different lengths of rods. The trolley wire is to be carried at a height of 22 ft. from the rails in the clear, with a maximum height of 19 ft. under bridges. Owing to the high tension used, no feeders will be employed, and the line will be fed near its center at Avon.

The wooden poles are of chestnut, and vary in length from 35 ft. to 55 ft., with an 8-in. top. The 55-ft. poles are to be used at points where the line crosses certain deck bridges, where the poles will be carried down and attached to the abutments. The wooden poles are spaced at a maximum of 120 ft. apart, with a minimum of 80 ft. The pole brackets are T's, 3 ins. x 3 ins. x 9 ft. long. The bracket insulators are double petticoated porcelain, 5 ins. high, and were supplied by R. Thomas & Sons.

The line will be fed by Niagara Falls power at 60,000 volts, transformed at the sub-station, directly to the trolley voltage of 11,000.

The Lackawanna & Wyoming Valley Electric Railway has completed a traffic arrangement with nearly all the steam railroads in and around Wilkesbarre and will now ship freight to all points on these lines.

WEAR AND TEAR, OR DISEASES OF CAR WHEELS

Perhaps it is hardly fair to the wheel to denominate the results of wear and tear as a disease, any more than a broken bone in a man's leg may be called by that name. Still, as the latter requires a doctor for readjustment and healing, and as precautionary measures must be taken by all to avoid such accidents, it may be permitted to deal with the accidental defects of car wheels under the caption of a disease, and at the same time point to the precautions that should be taken to prevent excessive wear or breakage.

Strictly speaking, there is but one class of wear to which a car wheel is legitimately subjected and which is to be reckoned with under all conditions of service. This wear is that of the tread caused by the rolling upon the rails and the abrasion resulting from the pressure of the brake shoes. As to how rapid this may be depends upon the weight of the cars, the condition of the track in the matter of sand and other abrasives, the quality of the brake shoes and the pressures with which they are applied. With all parts of truck, track and car in good condition, the tread should wear evenly and smoothly and the wheel remain in good running condition until it has been worn nearly through the chill. The difficulty is to keep all the elements affecting the wear of the wheels in good condition either by inspection or selection of materials.

With the track in good condition one of the most prolific causes of wheel destruction is skidding. It apparently takes but little to skid a wheel, and a short movement of this sort is quite sufficient to produce a flat spot. Just how rapidly this can be done is not known, and evidently depends on the quality of the chill, the weight of the car and the condition of the rail. To produce the best braking effect, the wheel should be rolling with the full speed of the car and yet be just on the point of skidding. As this is a danger point, the brake pressures are usually limited to 70 per cent. of the weight on the wheels, so that, while the most effective braking is not obtained, there is a margin of safety to guard against skidding. So long as the wheel is rolling the coefficient of friction between the wheel and the rail is at its maximum, because it is the friction of rest, but the moment that it begins to skid it becomes the friction of motion and falls correspondingly, with the result that a lower brake-shoe pressure will maintain the skidding than was required to start it in the first place.

The hanging of the shoes is a prolific cause of excessive pressure. Ordinarily the brake hangers are given an inclination away from the wheels, so that the shoes tend to fall off by gravity. Where this inclination is made excessive, or where the parts are loose as the result of wear, the upward motion of the rim tends to buckle the hanger and cause it to crowd in against the shoe like a knee or toggle joint, thus greatly increasing the pressure above anything that can be due to the pull on the brake handle or in the brake cylinder, stopping one pair of wheels of a truck while the other is rolling freely.

As already stated, it is not known as to just how far a cast-iron wheel will skid before it is slid flat, but it is evidently not far. In experimental work it has been found that with a sufficiently heavy load a flat spot of an inch in length can be produced by sliding through the same distance. When a slid-flat spot has once been caused in a cast wheel the proper course to pursue is to take it out at once and grind it round, else the trouble will increase at each revolution, to the detriment of the truck, track and car, and to the annoyance of passengers and passers on the street.

With steel wheels the trouble is not so serious, first because flatting does not so readily occur, and secondly because a small spot is apt to roll itself out and disappear. With cast iron the peculiar granular structure of the metal prevents this rolling and the spot simply hammers itself larger. Prevention is to be secured by the proper adjustment and application of the brakes.

Next to flat spots, excessive flange wear is exceedingly troublesome, and is produced by a variety of causes. Among these may be listed trucks out of square; cars riding on the side bearings; wheels improperly put upon the axles; track out of gage on curves; badly worn rails; bad frogs and switches; improper elevation of the rail; improper shape of wheel flange; and improper shape of rail head.

The question may be asked, with no possibility of receiving an answer, as to how much a truck can be out of square and still do no harm. Theoretically, of course, the truck should be perfectly square, but perfection is difficult to attain, and the question arises of how much a truck can be out and do no harm. A truck out of square means that one side stands ahead of the other, and that the axles are not at right angles to a line connecting their ends. This turns the flanges of the wheels on the side that is back out toward the rails. It is surprising how great an angle can be caused by a very small variation in the diagonal distances between journals. On a 5-ft. wheel base, a variation of an inch will double the angle of flange to the rail on a 6-deg. curve, thus tending to crowd the wheel against the rail, increasing the flange wear and adding to the tendency to derailment. Trucks, therefore, should be so built that they are square when they are new and be of such substantial construction that ordinary or even extraordinary wear and tear will not distort or twist them.

If the cars are down on their side bearings the trucks will turn under them with difficulty and all the work of turning must be done by the flange. On any curve the side bearings on one side or the other of the car are in contact and more or less resistance is set up. The proper thing is so to adjust the weights of the car that, as it stands freely upon the trucks, the side bearings shall be free or sustaining no load, and thus cut down the truck turning resistance to a minimum. With the best of conditions it is almost impossible to get a truck to square itself with the car on a tangent, and the greater the side-bearing resistances the farther out of true will the truck remain, increasing flange wear and hauling resistances. Not only does such a condition add materially to the wear of the flange, but it will cause a very serious wear of the rail and special work. A case of this kind is shown in Fig. 1. Here the tangent on the track just behind the special work of curves was wearing in a very peculiar manner. The curves of the road were laid with grooved rails, with such a width of groove that the inside rail took all of the wear on the curve itself, as shown in Fig. 2, which represents a section of the worn rail with the contour of the new rail dotted in at a point 5 ft. from the point of tangent where the grooved rail ended. From this it appears that, though the truck is on the tangent with both wheels, it is still bearing hard outwardly and so cuts away the rail. Fig. 1 shows the section of the rail 10 ft. from the point of tangency and indicates the excessive amount of wear that was caused by the truck shooting across the track as soon as it was free from the groove of the inner rail. This wear tapered off gradually, until at 60 ft. or 70 ft. from the point of tangency the two rails were worn to essentially the same extent. Investigation showed that this wear occurred only on those portions of the road where a certain type of track with which the car body rested heavily on the side bearings was used. The raising of the body and the substitution of another truck carrying the whole load on the center plate cured the trouble.

It is evident that if the car and trucks were in shape to produce such a rail wear as that shown in Figs. 1 and 2, there must have been something corresponding to it in the wear of the flange of the wheel. As a matter of fact this was the case, and the peculiar wear so induced is shown in

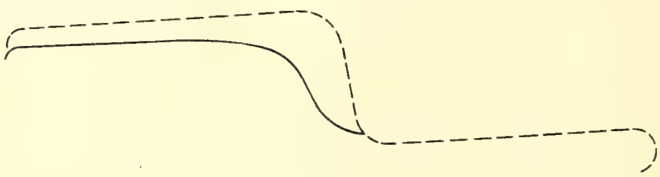


FIG. 1.

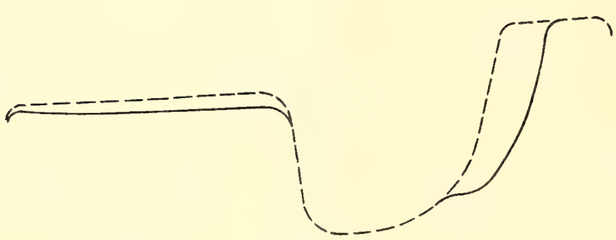


FIG. 2.

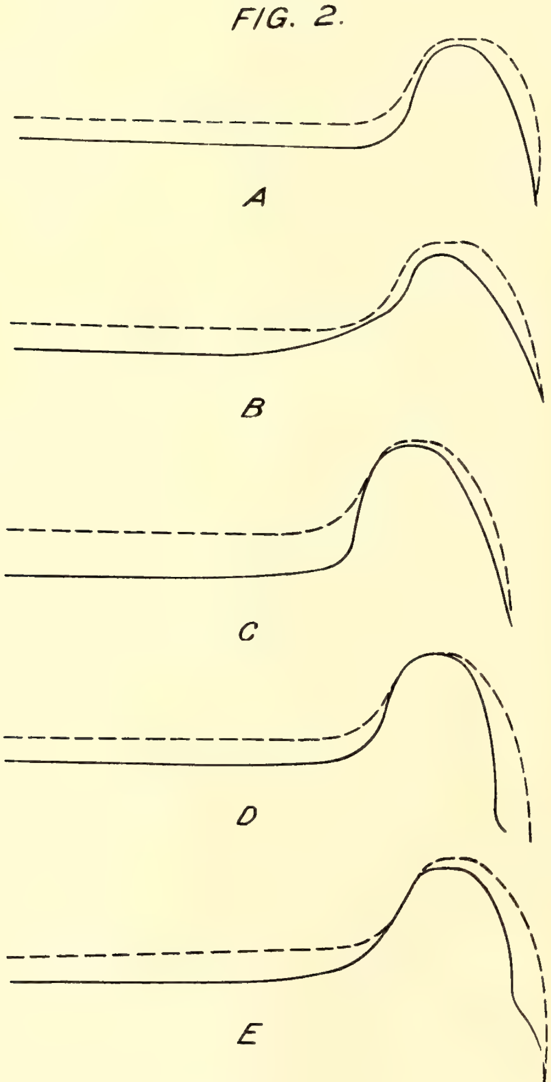


FIG. 3.

A, *B*, *C*, *D* and *E* of Fig. 3. Here we have a wear on both sides of the flange tending to cut away the gray metal at the back as well as the chill at the throat. The former is caused by the pressure of the flange against the lip of the groove on the inside rail, whose wear is shown in Fig. 2, and the throat wear by pressure against the lead-off on the tangent from the outside rail, whose wear is indicated in Fig. 1. Trucks riding hard upon the side bearings may, therefore, be taken as a prolific cause of sharp flanges and excessive flange wear.

Trucks that rest heavily upon the side bearings are not, however, the only source of sharp flanges. Nothing is better adapted to bring about such a result than wheels improperly pressed upon the axles. If they are out of gage by being too narrow they allow the truck to cant excessively upon curves, and thus throw the flange into a sharper angle to the rail than would ordinarily occur. That is to say, the inside wheel can run ahead of the outside one so far that the flange of the latter is brought against the rail at a very sharp angle and there, acting like a knife, it cuts the rail and is itself worn away. On the other hand, if the gage is too wide both wheels are pressed against the rails at all times, causing an excessive wear and a tendency to sharpen both flanges.

But the wheels may be very accurately to gage and still be so put upon the axle that sharp flanges will inevitably result. This occurs when the wheels are nearer one end of the axle than the other. That is where they are pressed on to unequal distances from the axle ends. The results of such a condition are shown in Figs. 4, 5 and 6. In each of these figures the two contours represent the worn treads of two wheels upon the same axle, wherein the one with the sharp flange represents the one near the end of the axle. They were steel wheels, else the excessive sharpness as indicated by Figs. 5 and 6 could not have obtained. The wastefulness of such a condition of affairs is indicated by the dotted lines, which show the amount of material that would have to be removed from each wheel in order to restore the original tread and flange contour on the wheel with a sharp flange and bring them both to the same diameter. This discovery made, a careful inspection of the wheels, not only for gage but for location on the axle, put an end to the difficulty.

Mismating of wheels also comes under this same category, and is an excessively difficult matter to avoid. It is due to the careless taping and marking of the wheels at the foundry and the careless selecting of wheels at the shop where they are put upon the axles; both dependent upon the labor employed, which is not always of the highest or most reliable type. Once under the car and worn, the dirt obliterates the marking and retaping, after a flange has worn sharp, is no evidence that the wheels were not of the same diameter at

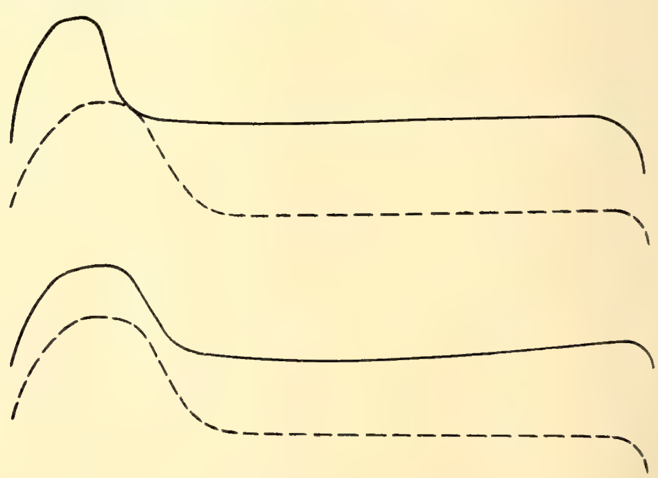


FIG. 4.

the start. Ordinarily it is the smaller wheel of a pair that should go sharp, because the larger one runs ahead and causes the flange of its mate to be turned out against the rail at all time. As in the case of the truck out of square, it is difficult to say as to just how much variation can be allowed in the circumference of a pair of wheels and do no harm. The usual limit is ⅛ in. The question was asked at the recent

convention of the Master Mechanics' Association, and a member stated that it had been his practice for some time in "turning up the steel-tired wheels with sharp flanges to make the sharp wheel slightly different in diameter, about 1-32 in., and that would be approximately 3-32 in. in circumference, and in re-turning these tires it is not one time in twenty that

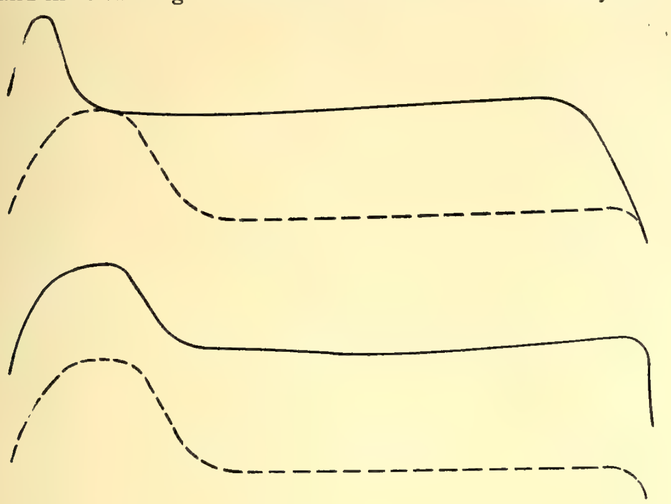


FIG. 5.

the sharp flange reappears in the same wheel, so that, perhaps, it should not be as much as 1-32 in. in diameter variation to have them run square."

Reading this strictly, it means that a variation of 1-32 in. in diameter on a pair of 33-in. wheels will cause the smaller one to run sharp. But it is not always the smaller wheel that carries the sharp flange. The other elements of trucks out of square, or stiff on the side bearings, or bad track may be more than an offset to the tendency of the larger of a pair of wheels to run ahead, and thus actually put the sharp flange on the one of greater diameter. A case of this was found where two pairs of mismated wheels were in the same truck, with the similar wheels on diagonal corners. The result of the combination, together with other features, was to put sharp flanges on the two wheels on the same side, which, when regarded individually as pairs one was on the large and the other on the small wheel.

Occasionally, too, sharp flanges will appear on both wheels

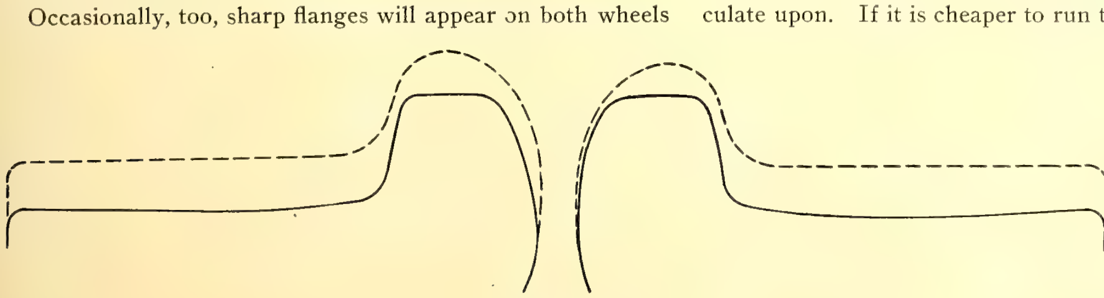


FIG. 8.

of the pair, in which case the off-hand diagnosis would be a truck that does not turn easily on the bearings. This diagnosis will not always hold, however, and a careful investigation of all of the attendant conditions should be made before reaching a conclusion.

It will probably be accepted as an axiom that the easier the riding of the car the less the stress and consequent wear and tear on the wheels. Hence anything that contributes to the ease of the car is a good thing for the wheels. So an easement approach to a curve and a uniformity to curvature on the curve itself is good for the wheels. The former is slowly creeping into practice as engineers learn, first, that it is desirable, and then how to lay it out. As for uniformity of curvature, very few men realize how really little of this there is on old track, where new rails have been put down.

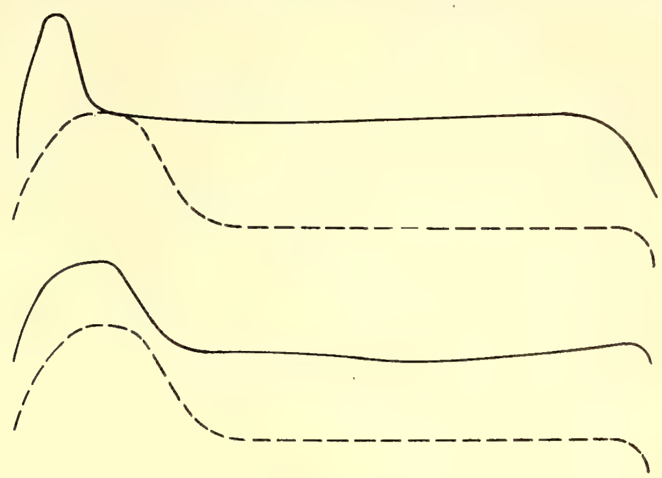


FIG. 6.

The track has been laid by the eye of the gang foreman and not by the transit, with the result that variations of several degrees of curvature may occur within a few feet, vibrating back and forth on a long curve. In a way, that produces the same result as a kinky rail. It is bad for the wheel by

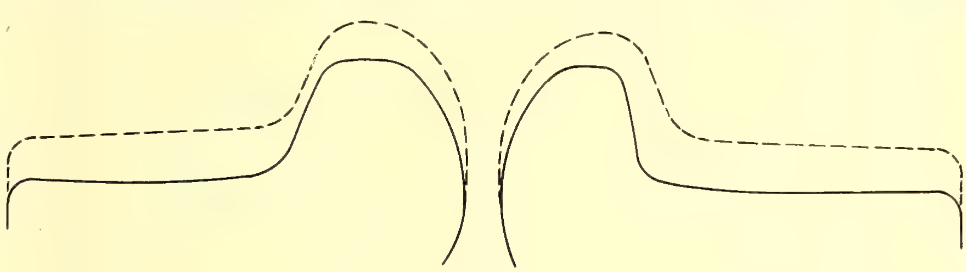


FIG. 7.

giving it a tendency to jump the track and wear sharp flanges. Inspection along these lines and a readjustment to true curvature with the transit when the pavement is up or at the first opportunity in the open country will be a paying investment.

Next to kinky curves comes a badly worn rail. In this it is a matter of dollars and cents for the management to calculate upon. If it is cheaper to run the wheels on the flanges with the resultant chipping than to lay new rail, then let them run. Figs. 7 and 8 show the shapes into which two pairs of wheels had worn where the head of the rail had become so reduced in height that the wheels ran on their flanges with a bearing on the tram of the rail. The wear was good as far as amount was concerned and came well down into the tread, but the crown of the flange was made flat by the peculiar conditions of its service. Chipped flanges are apt to result from this, as wheels are not intended to carry their load on this projection.

The same statement holds in regard to special work. It is the common practice to raise the flangeway of frogs and

crossings that are made of manganese or hardened steel so that the wheel is carried across the gap on the flange until the latter has cut its way down far enough to give the tread a bearing. This undoubtedly adds to the life of the special work, which is expensive, but it is productive of chipped flanges in a way that warrants some careful reckoning to determine whether broken wheels or short-lived special work is the more expensive.

The pounding on frogs and switches means hammered-down frog points and chipped tread flanges. A great deal of trouble of this sort is experienced where narrow tread wheels are run over track designed for the use of those having broad ones. The conditions obtaining under such circumstances are shown in Fig. 9. Here the running rail and the direction of motion are indicated by the arrow. When the narrow tread wheel reaches the point *C* it drops down between the

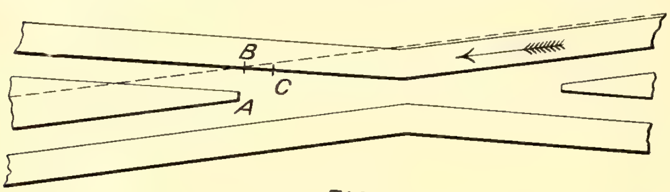


FIG. 9.

guard and the wing rail and strikes the frog point *A* such a blow that the latter is battered down until finally the wheel flange strikes the bottom of the flangeway and is broken or chipped. The remedy for this is to use a double spring frog, provided the controlling municipality will agree.

Rail elevations by which the thrust of wheel against the outer rail is regulated are difficult of adjustment on city streets to anything but very low speeds, and even then the flat curve must predominate. Usually the speed around such curves is put below the derailing point, but unless a suitable elevation is obtained the wheel stresses are very great and the wear correspondingly so, as indicated by Figs. 1, 2 and 3.

The proper shape of the tread, flange and rail head has been the subject of endless discussion for many a year, and the end is not yet. While no attempt at a final solution of the

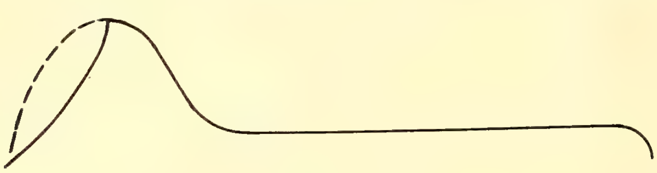


FIG. 10.

problem will be made in this place, attention will be called to a few points that have been definitely agreed upon. Fig. 10 illustrates a case in point where a company is obliged by the municipality to use a grooved rail with an excessively narrow flangeway on both curves and tangents. The result is that these wheels take the major portion of the wear on the back. That the track conditions are bad goes without saying, and there is no help save in the conversion of the powers that be to a spirit that will permit the use of a rail suited for traffic.

As for other features of rail-head shape, the radius of the corner curve best adapted to secure a minimum wheel and rail wear has not yet been fixed, nor are we wholly agreed as to the advisability of using a head with a vertical or a sloping side; but it seems to have been pretty well proven that a sloping head gives the less wear. As for the throat of the wheel, we have the same wide variations of opinion as to the desirability of long and short radii, which it is to be hoped the present committee on standard wheel treads will be able to settle satisfactorily and establish in common practice. The same holds true regarding the taper of the tread, though the consensus of opinion seems to be that a fairly sharp taper of about one in twenty is better than the flatter treads.

It seems strange that with all the years of experience that we have had with running wheels on rails, there should be this unsettled and lack of unanimity of opinion regarding the best forms to be used, and it only goes to show how exceedingly difficult it is to experiment along these lines and secure data from observation and experience that can be considered reliable and conclusive.

In addition to these diseases of wear and tear, there are others that require an immediate removal of the wheel. These appear in the forms of cracked spokes, brackets, and rims, broken flanges and even cracked hubs. Some of these can be referred back to excessive and long-continued brake-shoe pressure. Thus the heating of the rim by the shoe may produce stresses resulting in a crack. But very frequently this crack would not have occurred had the wheel not already been under internal stress. This is not always the case, and the difficulty of determining just how far the condition of the metal itself is responsible for its own failure under brake-shoe action is very great. Breakages due to derailments and kindred accidents are, of course, outside the pale of ordinary wear and tear, except as those derailments are caused by the defects of track or truck to which attention has been called. As for the disease of metal that manifests itself in chill cracks, shelling out and the like, that is a classification by itself and another story.

ST. LOUIS AND MILWAUKEE COMPANIES TO BUILD CARS

The United Railways Company of St. Louis is planning to build its own cars in the future, and to enable it to do so the company is now greatly increasing its shop facilities at Park and Vandeventer Avenues in St. Louis. The Milwaukee Electric Railway & Light Company, which is controlled by the same interests as the United Railways Company, is also planning to build its own cars, and the company will erect in the near future at Milwaukee comprehensive shops to take care of all of the company's construction and repair work. The land for the shops at Milwaukee, about 20 acres, was acquired several years ago, along the line of the Chicago, Milwaukee & St. Paul Railway, at a very central point in the city. The management of the two companies is now working on the development of plans and specifications for new cars to be built in both cities. The cars will have an under frame of steel, and possibly other parts of the framing will likewise be of steel.

To provide for the natural growth of the system at Milwaukee and to replace equipment as it wears out, the Milwaukee company would have to build from 50 to 75 cars annually. The requirements in St. Louis would compel the construction of from three to four cars per week, or an aggregate of from 150 to 200 cars annually. This output would also take care of the equipment of the St. Louis & Suburban system, which in all probability will be taken over by the United Railways Company between now and Jan. 1 next, as the stockholders of both companies voted affirmatively on Aug. 8 on the proposition for the consolidation of the properties.

A traffic squad of mounted police has been organized for service in Philadelphia, and while it has been on duty only a few days, reports indicate that conditions at points of heavy traffic have improved considerably. There are some twenty men in the squad and they do service between the Delaware River and Fifteenth Street, giving each policeman a block and a half of patrol.

WITNESSES

BY F. W. JOHNSON
Claim Agent, Connecticut Railway & Lighting Company

The up-to-date accident man of the transportation company of to-day begins the preparations for the defense of an accident long before its actual occurrence. Experience in the past has taught him that practically every accident must be investigated, handled and prepared with the expectation that lawsuits against his concern will grow out of it. He used to hope for the best in matters of this sort. But he got bravely over that after he had seen his fondest hopes repeatedly shattered before his very eyes. He soon became intensely practical in his views, and determined to be always prepared for the worst in every accident. And so it is that we find him hard at work preparing the means of defense for an accident months and months before it actually happens.

Of course he doesn't know just when, where or how the blow will fall. But since he is a railroad man, he realizes only too well that sooner or later the lightning is bound to strike—if not in one form, then in another. And if his defense is to stand up under the strain which will be placed upon it, it must be intelligently planned and the details faithfully executed. It must be sufficiently elastic to provide for accidents of every possible description, and must cover a wide range of territory.

At the base of his foundation we find him building a tower of strength which he calls "witnesses." Without this vital support he well knows that he stands about as much chance of victory in the trial of his case at court as does the proverbial snowball out in the sun of a hot summer's day.

Witnesses to his accident he must have. He himself may be ever so well satisfied of the non-responsibility of his concern for the results of the mishap, but it will avail him nothing if he lacks the witnesses with which to combat the manufactured evidence of his opponents, and the generally disastrous consequences of the "poor man vs. rich corporation" twaddle by means of which the other side readily gains the sympathy of the honest but easily deceived jurymen. Thus it is that, foremost among other important features of his preparations, the securing of the proper witnesses to an accident takes front rank. If the case be weak in this respect, it is a fatal defect and affords the other side a vulnerable point, and one upon which it will be quick to train its heavy guns.

For the sake of brevity, it may be said that the preparations for the securing of his witnesses is composed of two parts,—the educating of his conductors, motormen and inspectors regarding the persons most desirable as witnesses, as well as when, where and how to secure them. And secondly, the means which he provides his men with which to secure their witnesses. It is with the latter portion of this part of his preparations that this article deals. In this line of business, as in all others, if satisfactory results are to be obtained, it is of vital importance that the workman should be equipped with the proper appliances with which to work. And when one stops to consider that the use of improper or inadequate equipment in work of this character often results in the needless expenditure of thousands of dollars on a single accident, the folly of such economy quickly becomes apparent. And furthermore, when the proper equipment for the conductor, motorman or inspector costs but a cent or two, it would seem that there could be no argument to the contrary.

Once the accident has happened, it immediately devolves upon the conductor and motorman to secure an adequate number of witnesses upon which to base this defense. Therefore, we come to the question of the means by which or with which the conductor and motorman are to secure their witnesses.

The securing of witnesses under the conditions surrounding and immediately following a serious accident is invariably most difficult and well calculated to try the nerve of the best conductors and motormen. For this reason alone every possible effort should be made beforehand to assist the men in this important and highly difficult part of their work.

It may be that the car men are allowed or are supposed to jot down the names and addresses of their witnesses upon any piece of paper or note book that they may chance to have in their possession at the time of the accident. Possibly it is the back of an envelope; part of the day-card or the margin of a newspaper; any or all of which may be classed as unsuitable for this purpose.

Some concerns furnish their employees with note books for the purpose of securing witnesses to accidents. Among the best of these is a small note book some 5 ins. in length by 2½ ins. in width, designed to fit the vest pocket. On the covers are printed instructions regarding the securing of witnesses and the making out of the customary accident report.

These books are a step in advance, but still have serious drawbacks. Chief among these is the fact that the book is readily used by the employee for innumerable purposes other than that of securing witnesses, and it frequently happens that the book is about filled up before the accident happens. Again, this book leaves the employee in possession of the original list of witnesses to an accident, a fact which may afterward disturb the peace of mind of the accident man, should the employee see fit to sell out the list of witnesses to the other side. This latter defect is somewhat overcome by having the leaves of the book perforated and detachable, and by then insisting upon the employee tearing out the leaves containing the names and addresses of witnesses, and of then attaching them to the regular accident report. This latter course likewise has its bad features in that the loose leaves are liable to become detached from the report. Also, that it is difficult to overcome the tendency of a good part of the men to forget to tear out and to attach the leaves.

After experimenting for some time with this latter form of witness book, with detachable leaves, and vainly endeavoring to overcome its failings, the writer decided to cut loose from the book idea altogether. An entirely different method was adopted for the securing of witnesses. It proved a success from the start, and the results obtained have been extremely satisfactory, far beyond even our fondest expectations.

Briefly, the scheme is this:

A high-grade manila envelope selected for its wearing qualities, some 4½ ins. in length by 2½ ins. in width, was adopted. The envelope opens on one end, and resembles the average pay-envelope except that the flap to the envelope is sealed with a little metal clasp easily opened and closed. Upon the front of the envelope is this instruction.

ATTACH THIS ENVELOPE CONTAINING CARDS GIVING THE NAMES AND ADDRESSES OF YOUR WITNESSES, TO YOUR REGULAR ACCIDENT REPORT.

....

Name of conductor or motorman.

The envelope contains nine white pasteboard cards of sufficient stiffness for the purposes of writing. The cards are 3½ ins. in length by 2¼ ins in width. The front of the witness card reads:

Kindly Write Your Name and Address in Full, and Return to Conductor or Motorman.

....
(Name in full)

....
(Street and number)

....
(Name of town)

Upon the reverse side of the card appears—

Names are requested to assist in determining responsibility for this accident.

Information thus obtained aids us in our efforts to prevent future repetitions of similar mishaps. Supt. C. R. & L. Co.

Every conductor, motorman and inspector is obliged to have at least one of these witness packets in his possession at all times when on duty, and we encourage them to carry two packets. The packet is designed to fit the vest pocket. The envelopes of signed cards must accompany the accident report in every instance.

Some of the marked advantages possessed by this method over the old idea have proven to be:

An increase of over 40 per cent. in the average number of witnesses secured per accident.

A decrease of about 50 per cent in the total number of fictitious names and addresses secured as witnesses.

A marked decrease in the number of mistakes made by employees in understanding the names and addresses of witnesses.

One-half of the time required to secure a given number of witnesses by this method over the former.

Practically all of the witnesses signing at one and the same time, as against one at a time under the old idea.

Both conductor and motorman able to secure witnesses at the same time, each attending to his half of the car.

Inexperienced employees frequently become rattled at the time of an accident. No talking to do,—simply hand out and collect the cards. They speak for themselves.

Employees who are poor penmen or who are deficient in education have no writing to do.

A witness can write his own name and address more quickly and accurately than he can tell it to an excited conductor or motorman.

Conductor and motorman have a total of eighteen cards between them—ample for the average accident. Two packets per man doubles the number of cards per car.

The actual work of securing witnesses is placed upon the passengers themselves, thus leaving the employees free to a certain extent to assist the injured party, telephone headquarters, etc.

Unlike the witness books, the cards are suitable for no other purpose than that of securing witnesses.

The company secures the original signatures of the witnesses. Employees frequently make mistakes in transcribing names and addresses from a book to their accident report.

Employees do not retain the original list of witnesses, as the packets of signed cards have to accompany their accident reports.

At rush hours and at transfer points, employees are enabled to nail their witnesses before they scatter, by quickly handing out their cards on the spot, as opposed to writing down a single name at a time under the other method.

Accuracy in the names and addresses of foreigners, and of persons with difficult names and addresses.

No reason why employees should not sign the cards for persons so requesting.

Women passengers generally more willing to sign a clean white card bearing the company's name than to divulge their names to employees.

The witness card scheme has proven popular with the men. Employees off duty, when present at the time of an accident, whip out their cards and assist the regular crew in securing an abundance of witnesses.

THE SPOKANE & INLAND SINGLE-PHASE RAILWAY

Some months ago announcement was made of a single-phase railway which was projected to run between Spokane, Wash., and several neighboring cities, and which has now been completed. The railway was originally incorporated under the name of the Spokane Interurban System, with a capital of $3,500,000. The principal terminal of the road is Spokane, from which the line runs south through Waverly, Rosalia, Thornton and Colfax, which is the southern terminus at present, although the road has been surveyed and will be eventually extended to Penawawa, Wash., or Lewiston, Idaho. A branch leaves the main road approximately midway between Spokane and Colfax, and extends to Palouse City. The Y-connected system between Spokane, Colfax and Palouse City is about 106 miles in length. The roadway and overhead construction have already been completed.

In addition to its railway business the company proposes to transmit and distribute electric current for lighting and power both in Spokane and in the towns through which its lines pass. The country traversed by this road produces large quantities of wheat and fruit and is not provided with any railroad. This insures a large freight business for the new road, as the long wagon haul to the steam railroads will be avoided. For this reason the electric road is receiving the hearty support of the farming interests along its route.

There are three classes of service to be maintained—passenger, mail and express, and car-load freight. After a careful consideration of the various systems had been made, the Westinghouse single-phase, alternating-current system was adopted. As the cars of the Spokane & Inland enter Spokane over the tracks of the Spokane Traction Company, which operates a 600-volt, direct-current system, the use of both direct and alternating current is required on the interurban cars.

Power purchased from the Washington Water Power Company is used for the operation of this road. It is delivered as 4000-volt, three-phase, 60-cycle current to a frequency-changing station about 10 miles south of Spokane. This station will contain four motor-generator or frequency-changing sets, each of a normal rating of 1000 kw, consisting of a 1000-hp, 60-cycle, three-phase, 4000-volt induction motor; a 1000-kw, 25-cycle, 2200-volt, single-phase alternator of the revolving field type, and a 750-hp, 550-volt d. c. generator which is to float on a storage battery acting alternately as a motor and as a generator. These three machines will be mounted upon a single bed-plate. There are three exciter sets for the alternators, each consisting of a 75-hp, three-phase, 4000-volt induction motor and a 50-kw direct-current generator. A twenty-panel switchboard, electrically operated oil circuit breakers, and lightning protective apparatus complete the equipment of the frequency-changing station.

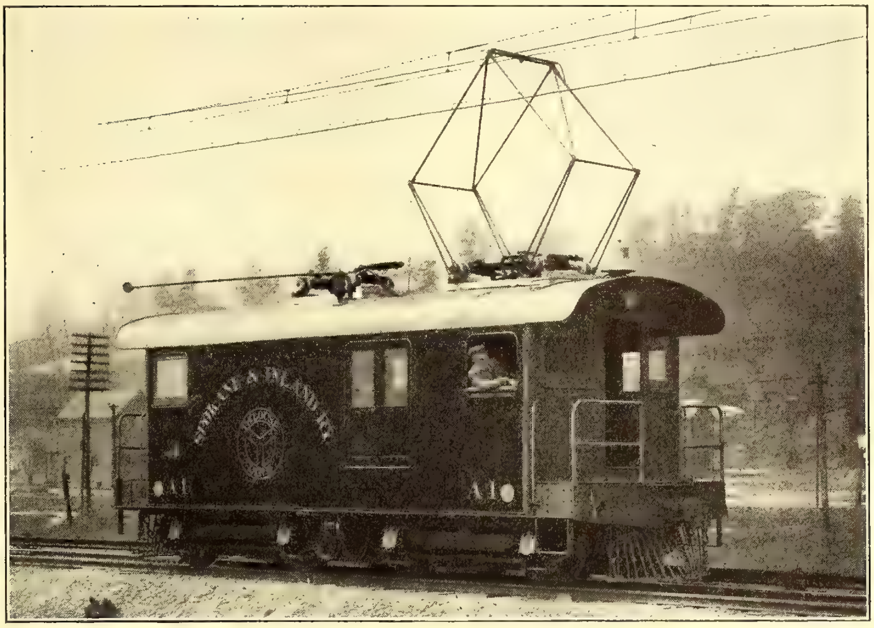
The 2200-volt, 25-cycle current is stepped up to 45,000 volts by four 1250-kw, oil-insulated, water-cooled transformers, and at this pressure is transmitted to fifteen static transformer sub-stations. Each sub-station is equipped with two 375-kw transformers of the oil-insulated, self-cooling type which step down the current from 45,000 volts to 6600 volts, which is the trolley line voltage. The cars and locomotives operate under three different potentials—6600 volts alternating current in the country, 700 volts alternating current in the small towns, and 600 volts direct current in the city of Spokane.

The trolley line is of the catenary construction with a No. 000 wire carrying 6600-volt alternating current. The high-tension transmission lines are No. 2 copper wires.

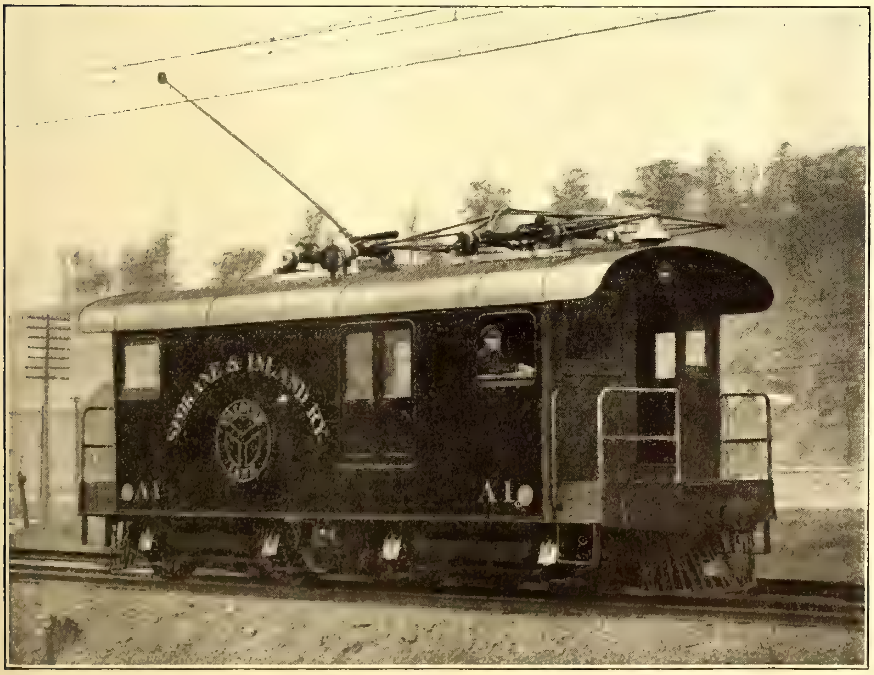
The electrical equipment of both the passenger and the express cars is identical and consists of four 100-hp, alternating-current railway motors per car, which will maintain a schedule speed of from 35 to 40 m. p. h. The locomotives are equipped with the same type of motors, but the latter are each of 150-hp capacity. Both the motor cars and the locomotives are operated by multiple-unit control.

These locomotives are capable of hauling seven standard freight cars fully loaded at about 30 m. p. h. on a level track. They will operate on the 6600-volt and 700-volt alternating-current lines and on the 600-volt direct-current line. Both pantagraph and wheel trolleys are used, as shown in the accompanying illustrations, the pantagraph trolley being for operation on the 6600-volt circuit and the wheel trolley for the 700-volt alternating and the 600-volt direct-current circuits. The cab of the locomotive serves to enclose the auxiliary apparatus, and is constructed entirely of steel. The locomotive weighs 49 tons and its length over bumpers is 29 ft. It has two swivel trucks with 38-in. driving wheels, and two motors are mounted on each truck and are geared to the axles. Both straight and automatic air brakes are used, the compressed air for which is supplied by two Westinghouse Air Brake Company's compressors, each driven by a 5-hp single-phase motor.

The motors are arranged in two groups, each group consisting of two motors connected permanently in series; so for the purpose of control these groups may be considered as single units in a two-motor equipment. Two auto-transformers are used on the locomotives, and an automatic overload and no-voltage circuit breaker is placed between the trolley and the transformers, which operates on either overload or no-voltage by breaking the current supply to the control magnets, thus automatically opening all the switches. This circuit breaker must always be closed by hand, and it will not stay closed unless the trolley is up and current is on the line. When the circuit breaker is thrown in the circuit is completed through the auto-transformers to ground. A commutating switch is automatically shifted to the alternating-current position and the small transformer furnishing current to the control system is cut into circuit, leaving the locomotives ready to start.



ELECTRIC LOCOMOTIVES USING PANTAGRAPH TROLLEY ON HIGH-TENSION, ALTERNATING-CURRENT CIRCUIT



ORDINARY TROLLEY WHEEL TAKING EITHER A. C. OR D. C. LOW-TENSION CURRENT

The unit switches are essentially similar to those used on direct-current systems. The control magnets are of the alternating-current type wound for 200 volts, and operate on about 80 volts direct current, but in both cases will operate down to about one-half voltage. These magnets serve to admit air under heavy pressure to the cylinders which operate the unit switches. These switches are assembled into a compact group, protected from exposure by the iron case in which it is mounted. Interlock contact blocks are provided which make it impossible for a switch to close or remain closed unless all the other switches operate according to their predetermined cycle.

The alternating current for the operation of the magnets by the master controller is obtained from the secondary of a small transformer which is connected to the 500-volt point of the main auto-transformer. When operating on direct current a resistance is placed in series with this auxiliary transformer across the 600-volt mains, and direct current is taken from a suitable tap on this resistance. This dispenses with the use of a storage battery for direct-current operation. The only mechanical operation in changing from alternating current to direct current is to change the trolleys; the control is changed automatically by the commutating switch, which is

a small pneumatically operated drum for shifting the control circuits. This drum is operated by a magnet connected directly to a 200-volt tap on the main auto-transformer, and has no direct-current connection. The switch has one position for direct-current operation and another for alternating-current operation, and it cannot be thrown to the alternating-current position unless alternating current is flowing through the magnet coil. If it should remain in the direct-current position no harm would be done. The reversing switch is similar to the commutating switch in its operation, but is furnished with two magnets and air cylinders, one for each position.

The preliminary order on this contract specified fifteen passenger cars, six express cars and six locomotives.

THE BOSTON-NEW YORK TROLLEY-BOAT TRIP POPULAR

An experiment in street railroading in the East that is attracting considerable attention because of the success which has attended the movement is the operation by the Old Colony Street Railway Company of a service from Boston to Fall River as part of a trip from Boston to New York, the journey from Fall River to New York being completed by boat under the direction of the Enterprise Transportation Company. As previously noted in the Street Railway Journal, the service was started last fall with one car. While it attracted a fair amount of travel from the outset, it was not noticeably popular until spring opened. Then business began to increase, and by the time summer was well advanced it became necessary to run two, and sometimes three cars, to handle the traffic. Thirty-five was a goodly number of passengers previous to this spring; but during the summer the company has been forced to provide for eighty or a hundred passengers, day after day; and on several occasions 130 or more have demanded passage.

The Old Colony's own trackage runs no nearer to Boston than Mattapan Square on this line, but through an arrangement with the Boston Elevated Railway it has been enabled to use Post Office Square as the terminus for this Boston-New York service. At the square there is ample street surface in the area behind the big Post Office building, and the Boston Elevated has had a siding there which had been little used for some time, and which offered a very acceptable stand for the Old Colony car, out of the direct line of street traffic and close to a broad sidewalk that could serve as a waiting room. From this stand is it that the car or cars are started every afternoon promptly at 2:30 p. m., and make the run out of the city by way of Milk Street, Federal Street, Dorchester Avenue, Boston Street, Columbia Road and Blue Hill Avenue—the last three being virtually parkways—to Mattapan Square. The run then is past the Blue Hills of Milton, and through Randolph to Brockton, whence the route is over the short line to Taunton, and so on to Fall River, which is reached at 5:30 p. m. The boat leaves at 6:30 p. m. and gets its passengers into New York next morning, as a rule, at about 7 a. m.

The Old Colony sells through tickets over this route for $1.75, of which $1 goes to the boat company. Most of the tickets are sold through agents' offices, and an attempt is made to ascertain the number of passengers that will have to be accommodated on any given day by requiring the agent to check off the number of tickets sold for each day in advance, and then date each ticket for the day on which it is intended to be used. But this plan has not proved altogether successful. Passengers who announce that they intend to make the trip on one day may change their minds after buying their tickets and present themselves unexpectedly a day beforehand. Still the difficulties which such a situation presents are not unsurmountable. Of greater moment is the handling of baggage, which has recently assumed considerable proportions. In the present situation, the carrying of so many suit cases and valises is often a serious problem, especially when open cars are used, and it is apparent that if the line would accept trunks for transportation it would draw heavily from the regular steam railroad patronage. Some of the trolley patrons at present are known to check their trunks through on a railroad mileage ticket and then buy a trolley ticket for their personal use, but more would travel by trolley if the trolley would take their trunks as well as their hand baggage. Traffic to Boston on the return run is not quite so heavy as the other way, but it has been large. The car leaves Fall River on arrival of the boat from New York and makes the run so as to arrive in Post Office Square, Boston, soon after half-past ten in the forenoon.

STREET AND ELEVATED RAILWAY MILEAGE—CARS AND CAPITALIZATION IN THE UNITED STATES, CANADA, CUBA AND THE INSULAR POSSESSIONS OF THE UNITED STATES

The accompanying table shows the mileage, number of cars and capitalization of the street and elevated railway companies in the United States and its insular possessions, Puerto Rico, Hawaii and the Philippines; also in Canada (including Newfoundland) and Cuba. The figures are given for the last two years, and are compiled from the last two editions of the Red Book of American Street Railway Investments. The dates of the reports from the different companies as given in the Red Book vary, but practically all of those in the 1906 edition are within the limits of June 30, 1905, and May 1, 1906. The average is believed to be not far from Dec. 30, 1905, so that for this reason the figures given in the table for 1905 may be considered as fairly representing the condition of the industry at the close of that year. In the same way the 1904 figures represent the condition at the close of 1904.

In a few cases, where reliable reports could not be obtained of the capital stock and funded debt of the companies, estimates have been made based upon the known physical property of the separate companies. As the roads not thus reporting were very small, however, both in number and importance, these estimates do not vitally affect the accuracy of the table. More important estimates had to be made of the outstanding stock and funded debt in cases where holding or leased companies owned a portion of the outstanding obligations or capital of sub-operating companies. These estimates were required as many of the holding companies do not report the proportion of the capitalization of sub-companies controlled by them.

It will be noticed that the cars used in electric railway service form 96 per cent of the total number of cars. The greater part of the horse, cable and steam mileage is confined to a few cities, notably New York, Chicago, Kansas City, San Francisco, Denver, Seattle and Tacoma. The miscellaneous power cars which make up the totals given in the Southern States are mostly isolated dummy lines. The total capital liabilities have increased 4.5 per cent during the year for the United States; 5.7 per cent for the U. S. Insular possessions; 6.0 per cent for Canada, and 34.3 per cent for Cuba.

[SUPPLEMENT TO STREET RAILW

STREET AND ELE E, CARS AND CAPITALIZATION IN UN

PERTIES CONTAINED IN "AMERICAN STREET RAILWAY INVESTMENTS," EDITI

STATES.	No. of Roads. 1905	Track Mileage. 1904	Track Mileage. 1905	Total Railways. Track Mileage. 1904	Total Railways. Track Mileage. 1905	Total Railways. Cars. 1904	Total Railways. Cars. 1905	Capital Stock. Total. 1904	Capital Stock. Total. 1905	Capital Stock. Increase for Year.	Funded Debt. Total. 1904	Funded Debt. Total. 1905
New England States.												
Maine	22	378	45	381	460	675	726	$5,933,013	$6,614,713	$681,700	$6,772,732	$7,770,500
New Hampshire	18	392	29	292	292	396	422	6,904,900	7,077,660	172,760	11,363,000	6,296,000
Vermont	10	112	12	112	121	125	125	2,191,100	2,365,600	174,500	1,533,000	1,533,000
Massachusetts	82	2,734	2,77	2,734	2,778	8,540	9,036	90,339,065	97,386,000	7,046,935	44,061,000	44,950,000
Rhode Island	13	403	445	403	445	932	1,027	16,557,700	17,357,100	799,400	19,221,031	20,847,957
Connecticut	21	687	687	687	687	1,620	1,708	28,847,240	28,934,240	87,000	20,999,642	22,015,492
TOTAL	166	4,606	4,780	4,609	4,783	12,288	13,044	150,773,018	159,735,313	8,962,295	103,950,405	103,412,949
Eastern States.												
New York	113	3,192	3,304	3,329	3,423	15,942	16,620	336,032,395	347,156,970	11,124,575	299,637,590	301,480,926
New Jersey	33	1,108	1,123	1,116	1,129	2,158	2,350	87,828,290	89,697,880	1,869,590	78,477,600	80,925,501
Pennsylvania	132	3,319	3,469	3,319	3,479	8,142	9,000	231,355,495	236,002,144	4,646,649	163,117,714	174,545,800
Delaware	7	137	146	137	146	258	268	4,900,000	4,970,000	70,000	7,074,000	7,084,000
District of Columbia	8	308	326	308	326	1,287	1,315	30,605,000	33,205,000	2,600,000	20,460,000	24,162,100
Maryland	12	454	496	454	506	1,724	1,950	17,779,006	17,818,000	38,994	52,401,000	52,559,000
Virginia	25	414	481	414	481	667	779	27,025,100	27,473,950	448,850	29,146,500	29,856,500
West Virginia	12	224	225	224	225	327	338	8,043,000	8,453,000	410,000	7,461,000	7,904,500
TOTAL	342	9,156	9,570	9,301	9,715	30,605	32,620	743,568,286	764,776,944	21,208,658	657,775,404	678,518,327
Central States.												
Michigan	42	1,203	1,509	1,203	1,509	2,090	2,288	39,987,000	40,556,000	569,000	44,139,500	45,893,000
Ohio	99	3,437	3,832	3,439	3,839	5,130	5,156	178,959,000	184,264,450	5,305,450	106,434,500	115,319,000
Indiana	51	1,360	1,695	1,367	1,702	1,625	1,934	54,532,500	55,585,417	1,052,917	50,182,500	52,441,100
Kentucky	12	292	296	292	296	860	872	10,890,900	17,890,900	7,000,000	10,491,000	11,680,300
Wisconsin	21	540	543	540	543	873	882	20,618,500	21,518,300	898,800	18,823,850	19,928,000
Illinois	59	2,080	2,293	2,177	2,387	8,358	8,274	174,059,650	180,654,200	6,594,550	112,639,500	119,072,000
Minnesota	7	360	413	360	413	1,116	1,210	25,591,495	26,453,000	861,505	17,794,000	19,554,000
Iowa	27	554	578	556	580	833	940	16,860,000	17,507,000	647,000	10,159,000	11,193,000
Missouri	22	902	1,097	938	1,106	2,853	2,860	74,116,500	77,049,500	2,933,000	86,710,000	90,022,000
TOTAL	340	10,728	12,256	10,872	12,575	23,738	24,416	595,615,545	621,478,767	25,863,222	457,373,850	485,102,400
Southern States.												
North Carolina	10	73	94	75	94	143	162	2,465,600	2,577,100	111,500	2,736,000	2,762,250
South Carolina	8	89	129	94	134	146	158	2,784,000	2,848,000	64,000	3,916,000	5,180,000
Georgia	13	356	364	363	371	542	558	19,588,000	20,229,894	641,894	16,988,000	18,322,000
Florida	9	85	101	98	114	146	137	2,316,000	2,666,000	350,000	1,919,000	1,958,000
Alabama	11	246	246	255	255	426	475	10,240,900	10,256,700	15,800	10,850,000	11,821,000
Mississippi	8	48	55	48	55	84	113	1,963,200	2,527,700	564,500	1,661,000	2,533,000
Tennessee	10	292	309	299	315	632	649	9,778,500	14,543,500	4,765,000	10,460,500	11,357,500
Louisiana	8	214	229	219	234	694	709	36,767,800	36,856,500	88,700	30,880,000	31,389,000
Arkansas	9	92	100	92	100	203	218	4,389,500	5,212,900	823,400	2,355,000	3,546,500
TOTAL	86	1,495	1,627	1,543	1,672	3,016	3,179	90,293,500	97,718,294	7,424,794	81,765,500	88,869,250
Western States.												
North Dakota	2	12	12	12	12	15	32	300,000	350,000	50,000	260,000	300,000
South Dakota	2	4	39	4	39	5	32	....	50,000	50,000	....	....
Nebraska	8	198	255	211	268	450	459	10,587,500	10,592,500	5,000	7,875,000	8,375,000
Nevada	1	5	5	5	5	5	5	100,000	100,000	....	75,000	300,000
Kansas	16	120	182	137	192	206	217	2,990,000	3,615,000	625,000	2,266,000	2,578,000
Indian Territory	2	27	27	27	27	18	30	312,500	600,000	287,500	266,000	608,000
Oklahoma	5	22	150	22	150	29	46	1,200,000	1,500,000	300,000	550,000	750,000
Texas	19	400	446	411	454	732	741	15,884,500	15,966,305	81,805	14,693,000	16,277,000
Colorado	12	334	334	353	391	630	655	18,900,000	19,312,000	412,000	17,759,000	20,538,000
Montana	5	64	74	64	74	106	106	1,695,613	2,455,613	760,000	1,240,000	1,500,000
New Mexico	2	15	19	15	19	12	15	350,000	350,000	....	300,000	350,000
Idaho	3	23	94	44	115	22	26	538,400	588,400	50,000	440,000	640,000
Utah	3	96	104	104	104	153	153	6,150,000	10,150,000	4,000,000	5,458,000	7,293,000
Washington	13	355	461	388	482	745	741	22,549,100	25,850,400	3,301,300	13,877,000	15,629,000
Oregon	9	208	228	224	235	502	512	6,665,000	9,035,000	2,370,000	9,978,000	12,345,000
California	42	1,668	1,840	1,928	2,014	2,600	2,695	92,761,750	100,003,500	7,241,750	79,498,000	80,886,000
Arizona	3	12	14	22	24	27	27	337,100	337,100	....	120,000	100,000
TOTAL	147	3,563	4,284	3,862	4,605	6,257	6,492	181,321,463	200,855,818	19,534,355	154,655,000	168,469,000
United States	1,081	29,548	32,517									

STREET AND ELEVATED RAILWAY MILEAGE, CARS AND CAPITALIZATION IN UNITED STATES AND CANADA.

COMPILED FROM THE STATISTICS OF THE VARIOUS PROPERTIES CONTAINED IN "AMERICAN STREET RAILWAY INVESTMENTS," EDITION OF 1906

STATES.	No. of Roads.	ELECTRIC RAILWAYS. Track Mileage.		Motor Cars.		Trail and Service Cars.		CABLE, STEAM AND HORSE RAILWAYS. Track Mileage.		Grip Cars or Locomotives.		Trail Cars or Horse Cars.		TOTAL RAILWAYS. Track Mileage.		Cars.	
	1905	1904	1905	1904	1905	1904	1905	1904	1905	1904	1905	1904	1905	1904	1905	1904	1905
New England States.																	
Maine	22	378	457	432	473	237	247	[illegible]	3	...	....	6	6	381	460	675	726
New Hampshire	18	392	292	338	348	58	74	...	...	....	....	....	....	292	292	396	422
Vermont	10	112	121	121	121	4	4	....	....	...	....	...	....	112	121	125	125
Massachusetts	82	2,734	2,778	7,305	7,792	1,210	1,219	....	...	...	..	25	25	2,734	2,778	8,540	9,036
Rhode Island	13	403	445	894	956	38	71	..	.	....	....	....	...	403	445	932	1,027
Connecticut	21	687	687	1,405	1,443	215	265	....	....	...	..	...	...	687	687	1,620	1,708
TOTAL	166	4,606	4,780	10,495	11,133	1,762	1,880	3	3	....	....	31	31	4,609	4,783	12,288	13,044
Eastern States.																	
New York	113	3,192	3,304	12,013	12 225	3,376	3,867	137	119	34	12	519	516	3,329	3,423	15,942	16,620
New Jersey	33	1,108	1,123	2,012	2 156	115	161	[illegible]	6	2	2	29	31	1,116	1,129	2,158	2,350
Pennsylvania	132	3,319	3,469	7,024	7,981	1,118	1,016	....	[illegible]	...	3	...	....	3,319	3,479	8,142	9,000
Delaware	7	137	146	253	263	5	5	...	....	...	...	...	....	137	146	258	268
District of Columbia	8	308	326	978	1,003	309	312	....	....	...	....	...	...	308	326	1,287	1,315
Maryland	12	454	496	1,669	1,875	55	69	....	10	....	6	....	....	454	506	1,724	1,950
Virginia	25	414	481	578	633	89	146	....	....	...	....	....	..	414	481	667	779
West Virginia	12	224	225	324	336	3	3	....	....	...	..	...	...	224	225	327	338
TOTAL	342	9,156	9,570	24,851	26,471	5,070	5,579	145	145	36	23	548	547	9,301	9,715	30,605	32,620
Central States.																	
Michigan	42	1,203	1,509	1,796	2 052	258	236	...	...	....	....	....	....	1,203	1,509	2,090	2,288
Ohio	99	3,437	3,832	4,499	4,627	580	529	2	7	...	....	6	...	3,439	3,839	5,130	5,156
Indiana	51	1,360	1,695	1,246	1,690	223	228	7	7	....	3	13	13	1,367	1,702	1,625	1,934
Kentucky	12	292	296	564	587	283	285	....	...	....	....	...	....	292	296	860	872
Wisconsin	21	540	543	783	819	60	63	.	....	....	...	.	..	540	543	873	[illegible]
Illinois	59	2,080	2,293	4,378	4,783	2,161	2,029	97	94	470	367	1,156	1,095	2,177	2,387	8,358	8,274
Minnesota	7	360	413	813	844	303	366	.	...	....	..	..	..	360	413	1,116	1,210
Iowa	27	554	578	729	794	93	141	2	2	....	5	2	...	556	580	833	940
Missouri	22	902	1,097	2,407	2,530	76	154	36	9	187	56	202	120	938	1,106	2,853	2,860
TOTAL	340	10,728	12,256	17,215	18,726	4,037	4,031	144	119	657	431	1,379	1,228	10,872	12,575	23,738	24,416
Southern States.																	
North Carolina	10	73	94	138	151	2	8	2	....	..	..	3	3	75	94	143	162
South Carolina	8	89	129	120	132	16	16	5	5	....	..	10	10	94	134	146	158
Georgia	13	356	364	468	469	63	82	7	7	....	..	11	7	363	371	542	558
Florida	9	85	101	109	111	20	22	13	13	3	....	14	4	98	114	146	137
Alabama	11	246	246	287	334	126	128	9	9	3	3	10	10	255	255	426	475
Mississippi	8	48	55	82	106	2	7	...	....	...	....	.	....	48	55	84	113
Tennessee	10	292	309	498	507	120	127	7	6	14	15	....	....	299	315	632	649
Louisiana	8	214	229	679	701	4	4	5	5	..	...	11	4	219	234	694	709
Arkansas	9	92	100	175	177	28	41	....	...	....	....	..	....	92	100	203	218
TOTAL	86	1,495	1,627	2,556	2,688	381	435	48	45	20	18	59	38	1,543	1,672	3,016	3,179
Western States.																	
North Dakota	2	12	12	15	32	.	...	.	...	....	....	....	....	12	12	15	[illegible]
South Dakota	2	4	39	3	30	2	2	...	....	....	...	....	....	4	39	5	32
Nebraska	8	198	255	347	357	86	86	13	13	....	...	17	16	211	268	450	459
Nevada	1	5	5	5	5	..	....	...	....	....	..	...	...	5	5	5	[illegible]
Kansas	16	120	182	118	127	62	64	17	10	....	....	26	26	137	192	206	217
Indian Territory	2	27	27	18	30	....	....	...	....	...	...	...	....	27	27	18	30
Oklahoma	5	22	150	27	43	2	3	...	....	...	...	...	....	22	150	29	46
Texas	19	400	446	656	663	64	66	11	8	....	....	12	12	411	454	732	741
Colorado	12	334	334	375	386	178	192	19	57	15	15	62	62	353	391	630	655
Montana	5	64	74	81	81	25	25	..	....	....	....	..	...	64	74	106	106
New Mexico	2	15	19	12	12	....	3	..	....	....	....	....	...	15	19	12	15
Idaho	3	23	94	13	15	7	9	21	21	2	2	...	...	44	115	22	26
Utah	3	96	104	143	143	7	7	8	...	3	3	..	....	104	104	153	153
Washington	13	355	461	383	406	268	269	[illegible]	21	94	66	...	...	388	482	745	741
Oregon	9	208	228	307	307	188	197	16	7	3	4	4	4	224	235	502	512
California	42	1,668	1,840	1,545	1,726	229	204	151	174	527	522	299	243	1,928	2,014	2,600	2,695
Arizona	3	12	14	10	10	7	7	10	10	....	....	10	10	22	24	27	27
TOTAL	147	3,563	4,284	4,058	4,373	1,125	1,134	299	321	644	612	430	373	3,862	4,605	6,257	6,492
United States	1,081	29,548	32,517	59,625	63,391	12,375	13,059	639	633	1,357	1,084	2,447	2,217	30,187	33,150	75,904	79,75[illegible]
Insular Possessions of U. S.—Hawaii, Porto Rico and Philippines	6	78	87	166	166	8	12	3	3	....	....	14	14	81	90	188	192
Canada, including Newfoundland	42	861	901	2,424	2,506	153	136	39	55	12	5	50	50	900	956	2,639	2,697
Cuba	2	55	175	160	195	...	...	....	....	....	10	...	....	55	175	160	205

STATES.	CAPITAL STOCK. Total. 1904	1905	Increase for Year.	FUNDED DEBT. Total. 1904	1905	Increase for Year.	CAPITAL LIABILITIES. Total. 1904	1905	Increase for Year.	STATES.
New England States.										**New England States.**
Maine	$5,933,013	$6,614,713	$681,700	$6,772,732	$7,770,500	$997,768	$12,705,745	$14,385,213	$1,679,468	Maine
New Hampshire	6,904,900	7,077,660	172,760	11,363,000	6,296,000	—5,067,000	18,267,900	13,373,660	—4,894,240	New Hampshire
Vermont	2,191,100	2,365,600	174,500	1,533,000	1,533,000		3,724,100	3,898,600	174,500	Vermont
Massachusetts	90,339,065	97,386,000	7,046,935	44,061,000	44,950,000	889,000	134,400,065	142,336,000	7,935,935	Massachusetts
Rhode Island	16,557,700	17,357,100	799,400	19,221,031	20,847,957	1,625,926	35,778,731	38,205,057	2,426,326	Rhode Island
Connecticut	28,847,240	28,934,240	87,000	20,999,642	22,015,492	1,015,850	49,846,882	50,949,732	1,102,850	Connecticut
TOTAL	150,773,018	159,735,313	8,962,295	103,950,405	103,412,949	537,456	254,723,423	263,148,262	8,424,839	TOTAL
Eastern States.										**Eastern States.**
New York	336,032,395	347,156,970	11,124,575	299,637,590	301,480,926	1,843,336	635,669,985	648,637,896	12,967,911	New York
New Jersey	87,828,290	89,697,880	1,869,590	78,477,600	80,925,501	2,447,901	166,305,890	170,623,381	4,317,491	New Jersey
Pennsylvania	231,355,495	236,002,144	4,646,649	163,117,714	174,545,800	11,428,086	394,473,209	410,547,944	16,074,735	Pennsylvania
Delaware	4,900,000	4,970,000	70,000	7,074,000	7,084,000	10,000	11,974,000	12,054,000	80,000	Delaware
District of Columbia	30,605,000	33,205,000	2,600,000	20,460,000	24,162,100	3,702,100	51,065,000	57,367,100	6,302,100	District of Columbia
Maryland	17,779,006	17,818,000	38,994	52,401,000	52,559,000	158,000	70,180,006	70,377,000	196,994	Maryland
Virginia	27,025,100	27,473,950	448,850	29,146,500	29,856,500	710,000	56,171,600	57,330,450	1,158,850	Virginia
West Virginia	8,043,000	8,453,000	410,000	7,461,000	7,904,500	443,500	15,504,000	16,357,500	853,500	West Virginia
TOTAL	743,568,286	764,776,944	21,208,658	657,775,404	678,518,327	20,742,923	1,401,343,690	1,443,295,271	41,951,581	TOTAL
Central States.										**Central States.**
Michigan	39,987,000	40,556,000	569,000	44,139,500	45,893,000	1,753,500	84,126,500	86,449,000	2,122,500	Michigan
Ohio	178,959,000	184,264,450	5,305,450	106,434,500	115,319,000	8,884,500	285,393,500	299,583,450	14,189,950	Ohio
Indiana	54,532,500	55,585,417	1,052,917	50,182,500	52,441 100	2,258,600	104,715,000	108,026,517	3,311,517	Indiana
Kentucky	10,890,900	17,890,900	7,000,000	10,491,000	11,680,300	1,189,300	21,381,900	29,571,200	8,189,300	Kentucky
Wisconsin	20,618,500	21,518,300	898,800	18,823,850	19,928,000	1,104,150	39,442,350	41,446,300	2,003,950	Wisconsin
Illinois	174,059,650	180,654,200	6,594,550	112,639,500	119,072,000	6,432,500	286,699,150	299,726,200	13,027,050	Illinois
Minnesota	25,591,495	26,453 000	861,505	17,794,000	19,554,000	1,760,000	43,385,495	46,007,000	2,621,505	Minnesota
Iowa	16,860,000	17,507,000	647,000	10,159,000	11,193,000	1,034,000	27,019,000	28,700,000	1,681,000	Iowa
Missouri	74,116,500	77,049,500	2,933,000	86,710,000	90,022,000	3,312,000	160,826,500	167,071,500	6,245,000	Missouri
TOTAL	595,615,545	621,478,767	25,863,222	457,373,850	485,102,400	27,728,550	1,052,989,395	1,106,581,167	53,591,772	TOTAL
Southern States.										**Southern States**
North Carolina	2,465,600	2,577,100	111,500	2,736,000	2,762,250	26,250	5,201,600	5,339,350	137,750	North Carolina
South Carolina	2,784,000	2,848 000	64,000	3,916,000	5,180,000	1,264,000	6,700,000	8,028,000	1,328,000	South Carolina
Georgia	19,588,000	20 229,894	641,894	16,988,000	18,322,000	1,334,000	36,576,000	38,551,894	1,975,894	Georgia
Florida	2,316,000	2,666,000	350,000	1,919,000	1,958,000	39,000	4,235,000	4,624,000	389,000	Florida
Alabama	10,240,900	10,256,700	15,800	10,850,000	11,821,000	971 000	21,090,900	22,077,700	986,800	Alabama
Mississippi	1,963,200	2,527,700	564,500	1,661,000	2,533,000	872,000	3,624,200	5,060,700	1,436,500	Mississippi
Tennessee	9,778,500	14,543,500	4,765,000	10,460,500	11,357,500	897,000	20,239,000	25,901,000	5,662,000	Tennessee
Louisiana	36,767,800	36,856,500	88,700	30,880,000	31,389,000	509,000	67,647,800	68,245,500	597,700	Louisiana
Arkansas	4,389,500	5,212,900	823,400	2,355,000	3,546,500	1,191,500	6,744,500	8,759,400	2,014,900	Arkansas
TOTAL	90,293,500	97,718,294	7,424,794	81,765,500	88,869,250	7,103,750	172,059,000	186,587,544	14,528,544	TOTAL
Western States.										**Western States.**
North Dakota	300,000	350,000	50,000	260,000	300,000	40,000	560,000	650,000	90,000	North Dakota
South Dakota	....	50,000	50,000	....	....	......	......	50,000	50,000	South Dakota
Nebraska	10,587,500	10,592,500	5,000	7,875,000	8,375,000	500,000	18,462,500	18,967,500	505,000	Nebraska
Nevada	100,000	100,000	....	75 000	300,000	225,000	175,000	400,000	225,000	Nevada
Kansas	2,990,000	3,615,000	625,000	2,266,000	2,578,000	312,000	5,256,000	6,193,000	937,000	Kansas
Indian Territory	312,500	600,000	287,500	266,000	608,000	342,000	578,500	1,208,000	629,500	Indian Territory
Oklahoma	1,200,000	1,500,000	300,000	550,000	750,000	200,000	1,750,000	2,250,000	500,000	Oklahoma
Texas	15,884,500	15,966,305	81,805	14,693,000	16,277,000	1,584,000	30,577,500	32,243,305	1,665,805	Texas
Colorado	18,900,000	19,312,000	412,000	17,759,000	20,538,000	2,779,000	36,659,000	39,850,000	3,191,000	Colorado
Montana	1,695,613	2,455,613	760,000	1,240,000	1,500,000	260,000	2,935,613	3,955,613	1,020,000	Montana
New Mexico	350,000	350,000	....	300,000	350,000	50,000	650,000	700,000	50,000	New Mexico
Idaho	538,400	588,400	50,000	440,000	640,000	200,000	978,400	1,228,400	250,000	Idaho
Utah	6,150,000	10,150,000	4,000,000	5,458,000	7,293,000	1,835,000	11,608,000	17,443,000	5,835,000	Utah
Washington	22,549,100	25,850,400	3,301,300	13,877,000	15,629,000	1,752,000	36,426,100	41,479,400	5,053,300	Washington
Oregon	6,665,000	9,035,000	2,370,000	9,978,000	12,345,000	2,367,000	16,643,000	21,380,000	4,737,000	Oregon
California	92,761,750	100,003,500	7,241,750	79,498,000	80,886,000	1,388,000	172,259,750	180,889,500	18,629,750	California
Arizona	337,100	337,100	......	120,000	100,000	—20,000	457,100	437,100	—20,000	Arizona
TOTAL	181,321,463	200,855,818	19,534,355	154,655,000	168,469,000	13,814,000	335,976,463	369,324,818	33,348,355	TOTAL
United States	1,761,571,812	1,844,565,136	82,993,324	1,455,520,159	1,524,371,926	68,851,767	3,217,091,971	3,368,937,062	151,845,091	**United States**
Insular Possessions of U. S.—Hawaii, Porto Rico and Philippines	3,181,500	3,391,500	210,000	1,930,000	2,033,000	103,000	5,111,500	5,424,500	313,000	Insular Possessions of U. S.—Hawaii, Porto Rico and Philippines
Canada, including Newfoundland	40,833,142	42,935,636	2,102,494	28,57[illegible],050	30,906,597	2,335,547	69,404,192	73,842,233	4,438,041	Canada, including Newfoundland
Cuba	13,500,000	18,750,000	5,250,000	8,550,000	14.800,000	6,250,000	22,050,000	33,550,000	11,500,000	Cuba

PROGRAM OF THE COLUMBUS CONVENTION

The final program and list of papers for the Columbus Convention has just been made public. The convention will be held, as already announced, in the State Fair Buildings, and the following days have been assigned to the meetings of the different bodies:

Monday, Oct. 15, Morning and Afternoon—Engineering Association, Claim Agents' Association.

Tuesday, Oct. 16, Morning and Afternoon—Engineering Association, Accountants' Association, Claim Agents' Association.

Wednesday, Oct. 17, Morning—First meeting of the "American" Association at which the members of the other associations will be present. Afternoon—Separate meetings of all of the associations.

Thursday, Oct. 18, Morning and Afternoon—American Association, Accountants' Association.

Friday, Oct. 19, Morning and Afternoon—American Association.

The committees on subjects of the four associations have been actively engaged for several months past on this portion of the convention, and the list below shows that there will be an unusual number of valuable papers and reports presented. Each of the four associations will have a program which in itself will amply repay those in attendance. While the list below is practically complete, it is expected that a later bulletin to be issued by the secretary will show several additional papers bearing upon subjects of more than usual interest. The official program follows:

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION

WEDNESDAY, OCTOBER 17, 1906—10:00 A. M. TO 12:30 P. M.

Convention called to order.
Address of welcome.
President's address.
Report of executive committee.
Report of secretary and treasurer.
Addresses by presidents of affiliated and allied associations.
Announcements.
New business.

WEDNESDAY, OCTOBER 17, 1906—2:00 P. M. TO 4:30 P. M.

Reports of committees.
(a) Membership.
(b) Compensation for carrying mail.
(c) Subjects.
(d) Car wiring.
(e) Standardization of equipment.
(f) Insurance.
(g) Promotion of traffic.

THURSDAY, OCTOBER 18, 1906—10:00 A. M. TO 12:30 P. M.
(Interurban Meeting)

Report of committee on heavy electric railroads.

Paper, "Elevated Railways and Their Bearing on Heavy Electric Traction," by H. M. Brinckerhoff, consulting engineer, New York City.

Paper, "Electric Railways in Sparsely Settled Communities," by E. P. Roberts, of the Roberts & Abbott Company, Cleveland, Ohio.

Paper, "Interurban Limited Trains," by Harrie P. Clegg, president, Dayton & Troy Electric Railway Company, Dayton, Ohio.

Paper, "Interurban Freight and Express," by E. C. Spring, general manager, Dayton, Covington & Piqua Traction Company, West Milton, Ohio.

Paper, "Tickets and Rates," by F. W. Coen, secretary and treasurer, Lake Shore Electric Railway Company, Cleveland, Ohio

Paper, "Some Distinctions Between City, Suburban, Interurban and Railroad Traffic," by Theo. Stebbins, expert, National Civic Federation, Cohasset, Mass.

Appointment of nominating committee.

THURSDAY, OCTOBER 18, 1906—2:00 P. M. TO 4:30 P. M.
(Employees Meeting)

Report of committee on rules.

Paper, "Young Men's Christian Association Branches," by E. M. Willis, railroad secretary, international committee of Young Men's Christian Association, New York City.

Paper, "Selection of Trainmen," by C. E. Learned, superintendent of inspection, Boston Elevated Railway Company, Boston, Mass.

Paper, "Discipline of Trainmen," by F. W. Brooks, assistant general manager, Detroit United Railway, Detroit, Mich.

Paper, "Uniforms and Badges," by John R. McGivney, purchasing agent, New Orleans Railway & Light Company, New Orleans, La.

FRIDAY, OCTOBER 19, 1906—10:00 A. M. TO 12:30 P. M.
(Executive Session)

Report of committee on municipal ownership.

Report of committee on public relations.

Paper, "Handling Public Complaints," by John A. Beeler, vice-president and general manager, Denver City Tramway Company, Denver, Col.

Paper, "Leaks Between Passenger and Treasurer," by A. H. Stanley, general superintendent, Public Service Corporation of New Jersey, Newark, N. J.

FRIDAY, OCTOBER 19, 1906—2:00 P. M. TO 4:30 P. M.

Report of nominating committee.
Election of officers.
Resolutions.
Unfinished business.
Adjournment.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION

TUESDAY, OCTOBER 16, 1906—10:00 A. M. TO 12:30 P. M.

Convention called to order.

Address of welcome, by P. V. Burington, secretary, Columbus Railway & Light Company, Columbus, Ohio.

Address, Hon. W. Caryl Ely, president, American Street and Interurban Railway Association.

Address, Prof. Bernard V. Swenson, secretary, American Street and Interurban Railway Association.

Annual address of president.
Annual report of executive committee.
Annual report of secretary and treasurer.
Appointment of convention committees.

TUESDAY, OCTOBER 16, 1906—2:00 P. M. TO 5:00 P. M.

Paper, "The Accounting of Capital Expenditures," by P. S. Young, comptroller, "Public Service Corporation of New Jersey, Newark, N. J.

Question Box.
Convention photograph.

WEDNESDAY, OCTOBER 17, 1906—10:00 A. M. TO 12:30 P. M.

Joint meeting with "American" Association.

WEDNESDAY, OCTOBER 17, 1906—2:00 P. M. TO 5:00 P. M.

Paper, "The Use of Curves in Statistics," by A. Stuart Pratt, general auditor and treasurer, Stone & Webster, Boston, Mass.

Report, committee on standard classification of accounts.

Election of officers.

WEDNESDAY, OCTOBER 17, 1906—8:00 P. M.

Informal reunion and dinner.

THURSDAY, OCTOBER 18, 1906—10:00 A. M. TO 12:30 P. M.; 2:00 P. M. TO 5:00 P. M.

Review, "Depreciation as Applicable to Electric Railways," by Robert N. Wallis, treasurer, Fitchburg & Leominster Street Railway, Fitchburg, Mass.

To be followed by discussion. This meeting will be an executive session.

Installation of officers.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION

MONDAY, OCTOBER 15, 1906—10:00 A. M. TO 12:30 P. M.

Registration.
Convention called to order.
Address of welcome.

Address, Hon. W. Caryl Ely, president, American Street and Interurban Railway Association.

Address, Prof. Bernard V. Swenson, secretary and treasurer, American Street and Interurban Railway Association.

Reading of the minutes of the last meeting.
Address of the president.

Annual report of the executive committee.
Annual report of the secretary and treasurer.
Appointment of convention committees.

MONDAY, OCTOBER 15, 1906—2:00 P. M. TO 5:00 P. M.

Report of special committees.
Report of committee on control apparatus.
Report of committee on maintenance and inspection of electrical equipments.
Paper, "Ballast," by Chas. H. Clark, engineer maintenance of way, Cleveland Electric Railway Company, Cleveland, Ohio.
Report of committee on way matters.
Paper, "Ties, Poles and Posts," by C. A. Alderman, chief engineer, Cincinnati Traction Company, Cincinnati, Ohio.

TUESDAY, OCTOBER 16, 1906—10:00 A. M. TO 12:30 P. M.

Report of the committee on standardization.
Paper, "Gas Engines," by Paul Winsor, chief engineer motive power and rolling stock, Boston Elevated Railway Company, Boston, Mass.
Paper, "Underground Cables," by H. G. Stott, superintendent, motive power, Interborough Rapid Transit Company, New York, N. Y.

TUESDAY, OCTOBER 16, 1906—2:00 P. M. TO 5:00 P. M.

Paper, "Economy of Car Equipment, Weights and Schedules," by E. H. Anderson, Schenectady, N. Y.
Discussion of the Question Box.

TUESDAY, OCTOBER 16, 1906—8:00 P. M.

Informal reunion and dinner.

WEDNESDAY, OCTOBER 17, 1906—10:00 A. M. TO 12:30 P. M.

Joint meeting with "American" Association.

WEDNESDAY, OCTOBER 17, 1906—2:00 P. M. TO 5:00 P. M.

General business.
Election of officers.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION

MONDAY, OCTOBER 15, 1906—10:00 A. M. TO 12:30 P. M.

Registration and badges at Ohio State Fair Grounds.
Secretary Davis at Fair Grounds.
President Rhoades at Southern Hotel.

MONDAY, OCTOBER 15, 1906—2:00 P. M. TO 4:30 P. M.

Convention called to order.
Address of welcome, by B. B. Davis, claim agent, Columbus Railway & Light Company, Columbus, Ohio.
Address, Hon. W. Caryl Ely, president, American Street and Interurban Railway Association.
Address, Prof. Bernard V. Swenson, secretary, American Street & Interurban Railway Association.
Minutes of last meeting.
Address of the president.
Annual report of executive committee.
Annual report of secretary and treasurer.
Appointment of convention committees.

TUESDAY, OCTOBER 16, 1906—10:00 A. M. TO 12:30 P. M.

Paper, "Which is the Better Policy, Quick or Delayed Settlements?" by A. J. Farrell, claim agent, International Railway Company, Buffalo, N. Y.
Paper, "The Policy of the Claim Department Toward the Public," by W. F. Weh, Cleveland Electric Railway Company, Cleveland, Ohio.

TUESDAY, OCTOBER 16, 1906—2:00 P. M. TO 4:30 P. M.

Paper, "The Claim Agent's Work of the Future," by C. Willis Hare, United Gas Improvement Company, Philadelphia, Pa.
Discussion, "The Relation of Statistical Bureaus to the Claim Agent's Work," by Russell A. Sears, C. S. S. Miller, Bayard P. Holmes and William DeMilt Hooper.

WEDNESDAY, OCTOBER 17, 1906—10:00 A. M. TO 12:30 P. M.

Joint meeting with "American" Association.

WEDNESDAY, OCTOBER 17, 1906—2 P. M. TO 4:30 P. M.

Paper, "Methods of Management," by H. C. Bradley, Union Traction Company, Chicago, Ill.
Question Box.
General business.
Election of officers.

The address of welcome at the Wednesday morning session to all of the associations will be delivered by Gov. Andrew L. Harris, of Ohio. In addition, Col. John Y. Bassell, secretary of the Columbus Board of Trade, will speak for that body and for the Columbus convention committee.

ENTERTAINMENTS

The entertainment program has not been fully decided upon. It will be announced later. It is expected, however, that there will be a theater party on Wednesday evening, and that the annual banquet will be held on Thursday evening. In addition, there will be interurban trolley parties, automobile rides, golfing and a number of other forms of amusement, most of which will be especially arranged for the ladies of the convention. This portion of the program is being actively and efficiently cared for by the entertainment committee of the Manufacturers' Association, in consultation with the executive committee of the American Street and Interurban Railway Association. While the social side and entertainments of the convention will not be allowed to conflict with the more serious work to be done, these features of the program will receive adequate attention.

HOTELS

A list of the hotels in Columbus, with their rates, was published in the Street Railway Journal for May 26. Of these the four leading hotels are the Southern, Chittenden, Hartman and Neil. The executive committee will be at the Southern, and the Hartman will probably be the headquarters for the ladies of the convention. The Chittenden is an excellent hotel, while the Neil is possibly the best known of the Columbus hotels. All of the hotels are in the center of the city and within a short distance of the Southern. The hotel rates will be $2 a day and upwards on the American plan and $1 a day and upwards on the European plan. There will be no advance in the regular hotel rates during the convention week. Those who are intending to be in Columbus for the convention and have not engaged accommodations should address Ben H. Harmon, secretary of the Columbus Board of Trade, Columbus, Ohio, stating the number of rooms desired, whether with or without bath, number of people who will probably occupy rooms, and whether or not any ladies will be in the party. For the benefit of those who cannot engage hotel accommodation before reaching Columbus, the Columbus Board of Trade will have an information bureau located at the Southern Hotel, in charge of M. P. Nye. Those reaching Columbus without having secured definite hotel accommodations should consult Mr. Nye immediately upon their arrival in Columbus. All hotel assignments will be made through this bureau.

EXHIBITS

The exhibit halls at Columbus are larger and the space available is better fitted for exhibit purposes than with any other hall or halls used at previous conventions of the association. These advantages have been realized by the manufacturers of street railway apparatus, and reports already received indicate that this portion of the convention will form by far the largest and most complete display of street railway apparatus which has ever been gathered together. The total amount of floor space, for which application has been made already largely exceeds that of the 1905 convention exhibit at Philadelphia and represents assignments for 135 different companies. A list of exhibitors and plan of the exhibit hall were published in the Street Railway Journal for Aug. 11.

Arrangements have been made at the exhibit hall for promptly and effectively caring for the needs of both delegates and exhibitors. The information and registration bureaus will be just inside the main entrance. They will include the exhibit hall headquarters for the four street railway associations, and the registration booth and headquarters of the Manufacturers' Association. A local postoffice, telephone booths and telegraph stations will also be located in the exhibition hall adjoining the place of registration.

NEW FUNERAL CAR IN CLEVELAND

For several years past the Cleveland Electric Railway Company has been operating a special car for funerals. It has proved such a convenient and economical method of handling interments that the car has been busy practically all the time, and recently it was decided to build another car for this service. From its experience with the first car, the company gained a number of ideas as to desirable improvements, and

CLEVELAND FUNERAL CAR READY FOR A TRIP

it was decided to carry these out in its own shops. The new car was placed in operation a few weeks ago.

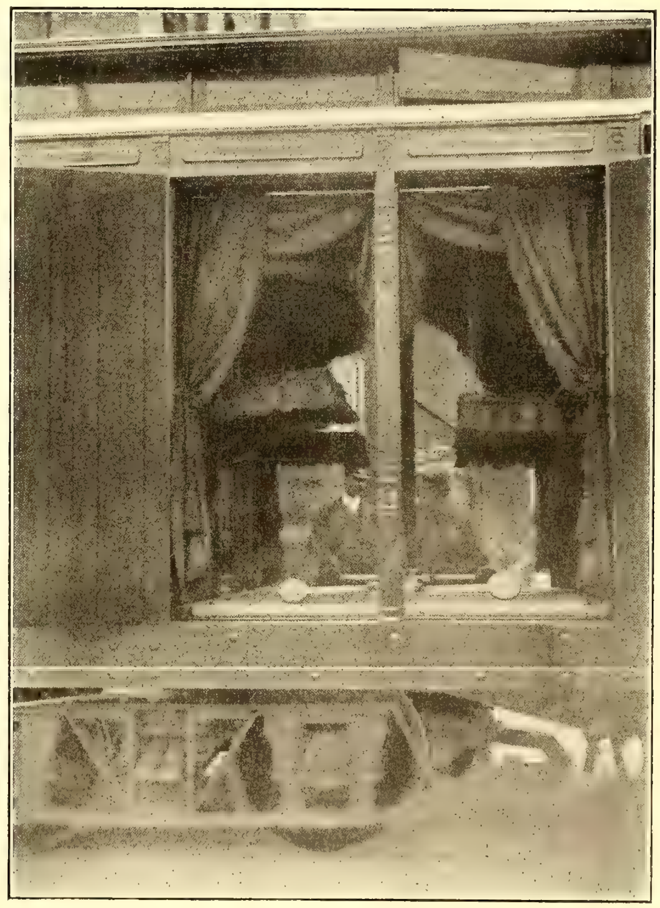
The first car was rebuilt from a combination suburban car, and in order not to change the bulkhead between the passenger and baggage compartments, the latter was left the same size as before, thus giving space for four caskets. It has never been found necessary to handle this number of caskets, so that the new car was built with less room for this purpose, thus materially increasing the seating capacity.

The length of the new car over all is 45 ft. 3 ins., and the car body is 36 ft. 3 ins. x 8 ft. 6 ins. The height from the top of the trolley stand to the floor is 13 ft. 1 in., and from the floor to the rail, 33½ ins. There are two steps. The rear and front vestibules are made to enter from either side, and there is no entrance to the car from the front vestibule. The passenger compartment is divided into two sections. The front compartment is used by the immediate family of the deceased, while the friends occupy the rear compartment. The front compartment is fitted with ten willow chairs, upholstered in leather, while the rear one contains twelve leather upholstered Hale & Kilburn high-back coach seats. The windows in the passenger compartments have elaborate draperies of royal purple broadcloth, with black satin facing. Electroliers, hat hooks, and trimmings throughout are of oxidized brass of special design, furnished by the Dayton Manufacturing Company, of Dayton, Ohio. The floor in the family compartment is covered with linoleum and that of the rear with rubber matting. The aisle in the passenger compartment is 20½ ins. wide. The front, or hearse, compartment of the car is arranged to accommodate two caskets, which may be put in from either side, through doors opening to the top of the windows. The floor of the compartment is fitted with six heavy rubber rollers, permitting easy handling of the casket. To prevent any side motion of a casket, and to hold it firmly in place, there are rubber-padded metal brackets, which are quickly adjustable to accommodate any length of casket. This compartment is draped in black broadcloth, and there are several folding shelves, for carrying flowers, draped with the same material.

The interior finish of the passenger compartment is of cherry, with hand-carved floral designs over end panels and doors. The ceiling is painted deep blue, with gold ornamentations. The toilet rooms, which are located between the front and rear compartments, are fitted with a folding lavatory and a Hart sanitary closet, with all necessary appliances, and having a tank in the roof for supplying water for both purposes. The exterior of the car is finished in dead black, with hand-carved ornamentations and gold striping and lettering.

The car is mounted on two Peckham No. 25 trucks, with 4-ft. 8-in. wheel base, and equipped with four Westinghouse No. 101 motors and K-6 controller. It is also equipped with Eclipse life guard, Imperial arc and incandescent head light, Nichols-Lintern air sander with Cleveland Electric Railway Company's improved sand box, Christensen air brakes and Lintern tail lights. The ventilator glass is bevel-chipped plate glass with ornamental design. The side windows are of standard steam coach type, the top section being made of ornamental glass. The car has a National air whistle, and is heated by Consolidated Car Heating Company's heaters.

Practically every one of Cleveland's cemeteries is accessible from the car lines of the Cleveland Electric Railway Company, and in two instances there are spur lines into the cemeteries; new burial grounds are being



SIDE DOOR OF CAR OPENED TO SHOW THE HEARSE COMPARTMENT

designed with this in view. Near some of the other cemeteries, loops have been built, so that the car can lay up. The charge for the service is very reasonable. That for the older car is $10 for the round trip to and from any cemetery on the lines of the company, that for the new car is $15. The lower price will be retained for the older car, as this is a great boon to the thousands of poorer people of the city. As the new car is much more elaborate, it will be used largely by the wealthier people, thus giving the

service a much broader field than has been possible with but one car. One crew is retained exclusively in this service. The men are old employees who have been with the company for years, and who were selected because of their courteous and accommodating qualities. When both cars are out at the same time, extra crews are delegated for the service. The permanent crew has charge of both cars, and sees that they are kept in the best of order.

The cars are also used on all the interurban lines out of Cleveland, either for burials to points on these lines, or from such points to Cleveland cemeteries. Thus far the company has not permitted their use exclusively on foreign roads, but it is possible that this may be done now that the company has two cars. The cars have been as far west as Norwalk, east as far as Ashtabula, and south as far as Canton; in other words, within a circle of about 60 miles from Cleveland, which is about the limit of distance that they are available for a single day's trip. For such interline service, the interurban company receives its chartered car rate, and in cases of long trips the city company makes an extra charge to compensate for the car being away for more than the usual length of time.

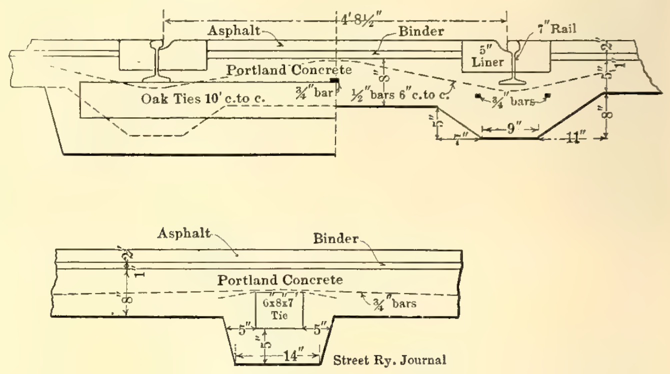
Although the cars are in constant use, it is seldom that they hold up the schedules on the city lines. When an engagement is made the car is usually sent to the car house nearest the point of funeral an hour or so before the appointed time, and then they gage their time so as to be at the proper street on the dot. The company has the friendship of a great majority of the funeral directors, and they almost invariably coöperate with the company in the matter of having services gaged so that there will be no delays. It is seldom that a hearse is used in connection with the service, and where houses and churches are some distance from the car line the funeral director transfers the casket to the car in his burial wagon.

Considering the convenience, carrying capacity and economy of the service, the cars are a great boon to the public. They have been quite profitable to the company, and they are growing more so as the public becomes acquainted with their advantages.

TRACK WORK AND GAGE WIDENING AT SIOUX CITY

During the past few years extensive improvements have been made on the street railway system of Sioux City, Ia. The several street railway properties in the city were consolidated in 1899, and about half of the track mileage taken over was standard, while the remainder was 4-ft. 4-in. gage. When the Armour and Swift interests acquired the consolidated properties a few years ago, in view of the fact that operating difficulties were materially increased by the two gages, the work of changing the narrow-gage track to standard was begun. Up to the present time about 10 miles or 12 miles have been changed over, and during this year about 4 miles additional will be rebuilt. The narrow-gage track was originally constructed differently in different parts of the city. Some of it was laid on concrete beams, while in other portions the rails were embedded in concrete and rested on corrugated steel ties of the Daniel type, placed with centers 3 ft. apart.

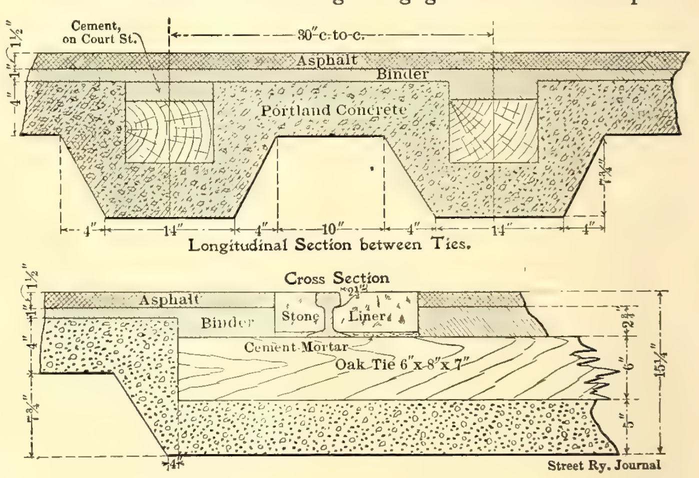
The accompanying drawings show the methods used in reconstructing some of the track originally built without the metal ties. This method of construction was designed by J. M. Lewis, city engineer of Sioux City, in conjunction with E. L. Kirk, manager of the railway company. The oak ties placed with the centers 10 ft. apart are embedded in concrete, and concrete beams under the rails extend to a depth of 9 ins. below the base of the rail. This beam is reinforced with two ¾-in. square steel rods which pass over the ties, one on each side of the rail, and between ties drop about 2 ins. below the base of the rail. An additional longitudinal bar of the same size is embedded in the concrete equidistant between the rails. Transverse bars are placed with centers 6 ft. apart. These, which extend beyond the ends of the ties, pass under the base of the rail and rise almost to the top of the concrete at the center of the track. A 7-in. 80-lb. T-rail in 60-ft. lengths is employed, and paving blocks are placed on either side. Two ins. of asphalt on 1 in. of binder covers the concrete. In another form of construction which is employed on Pierce and Court Streets, the ties are embedded



DETAILS OF SIOUX CITY TRACK WORK ON ASPHALTED STREETS

in concrete, but are placed 30 ins. apart. In this construction not so much concrete is placed under the rail and the steel bar reinforcement is not employed.

A novel method of widening the gage will be on that portion of the track laid with corrugated ties. The ties are laid on concrete and the clamps, one on either side of the rail holding it in place, are bolted to the tie with the nut on the under side. The gage will be widened by simply setting one of the rails 4½ ins. out nearer the end of the tie. To avoid disturbing the tie and the concrete underneath it, those clamps originally on the outer side of the rail will be turned and utilized as the new inside clamps. A new outside clamp will be fastened to the tie by threading a newly drilled hole in the tie and employing a cap screw to bolt the lug to the rail. The tie rods will be lengthened by attaching to them a short length of rod by means of a long threaded nut or sleeve.



TRACK WORK ON PIERCE AND COURT STREETS, SIOUX CITY

A few blocks of the track laid on the steel ties have been widened simply by setting the rail out nearer the end of the

tie and embedding it in concrete to a depth sufficient to hold it without the clamps. The total cost for the reconstruction of 17 miles of track that will eventually be changed will be about $200,000. All of it, however, is not laid in paved streets, as some is on gravel roads and others on dirt.

Changing the width of the gage necessitated, of course, some changes in the cars. The company was fortunate in that the majority of the trucks were built with frames of standard width, in which the narrow gage was taken care of by a reverse dished wheel, and with these trucks it was simply necessary to put on the axles wheels dished in an opposite direction and to rearrange the brake rigging. In ordering trucks with narrow frames within the past few years, the specifications have required these to be so built that the frames could be widened without difficulty. All bolt holes required in the change were drilled and other provisions were made, and this precaution facilitated greatly the work of changing the trucks. With these careful provisions made in advance, the work of gage widening was facilitated.

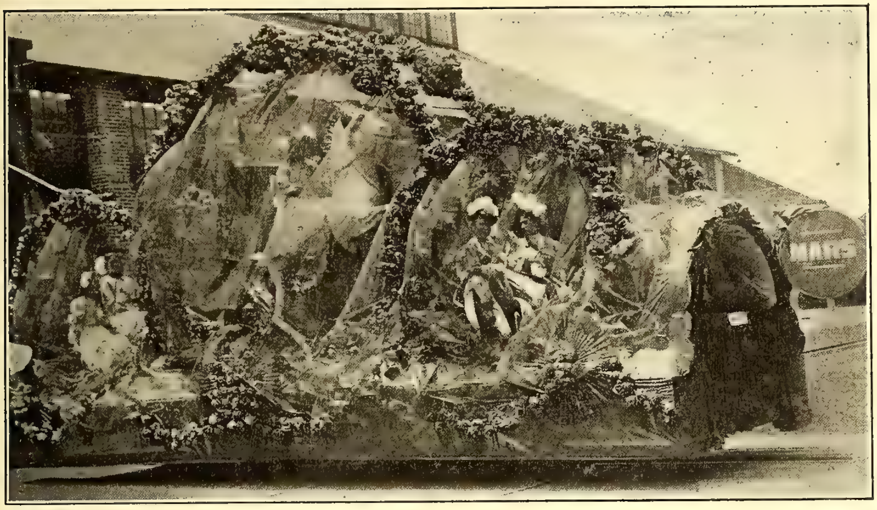


FIG. 1.—ELECTRIC FLOAT "MARS," READY TO LEAVE THE CAR HOUSE

ELECTRIC FLOAT PARADE IN LOS ANGELES

It is doubtful whether any other factor has had such influence in developing Mardi Gras and similar celebrations to their present magnificence as the electric railway. Instead of poorly illuminated floats drawn by horses, it is now the custom to have the local railway adapt its flat cars for this purpose, and by the use of electricity the decorative effects need be limited only by the ingenuity of the artist. More than twenty years ago some Los Angeles business men took up the scheme of giving an annual flower show, and several of these were held in the springtime when the floral display was best. These were so successful they attracted much attention. About a dozen years ago the flower show held in doors was expanded into the Fiesta which could be given out doors and thus be seen by all eyes. For four or five successive years beautiful street displays in which flowers played the principal part were held, and attracted the attention of people in all parts of the United States. Tourists put off their visits to the season when the Fiesta would be given.

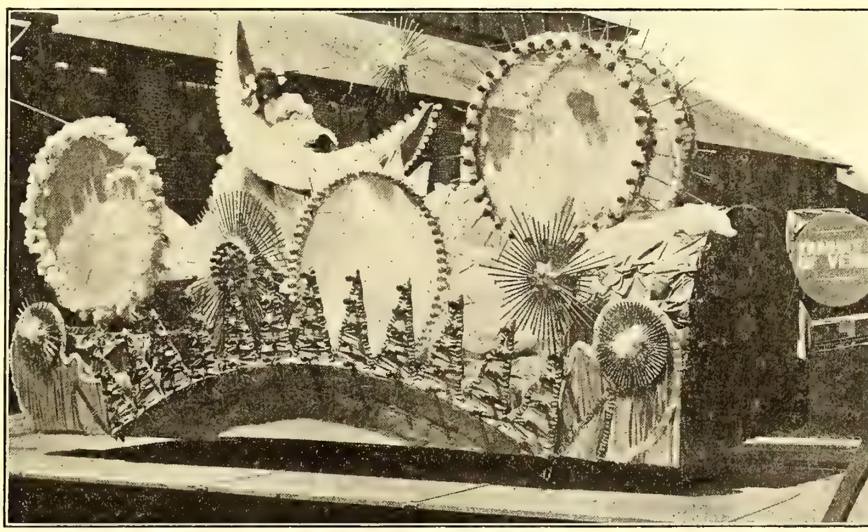


FIG. 2.—THE SPLENDIDLY ILLUMINATED FLOAT REPRESENTING THE TRANSIT OF VENUS

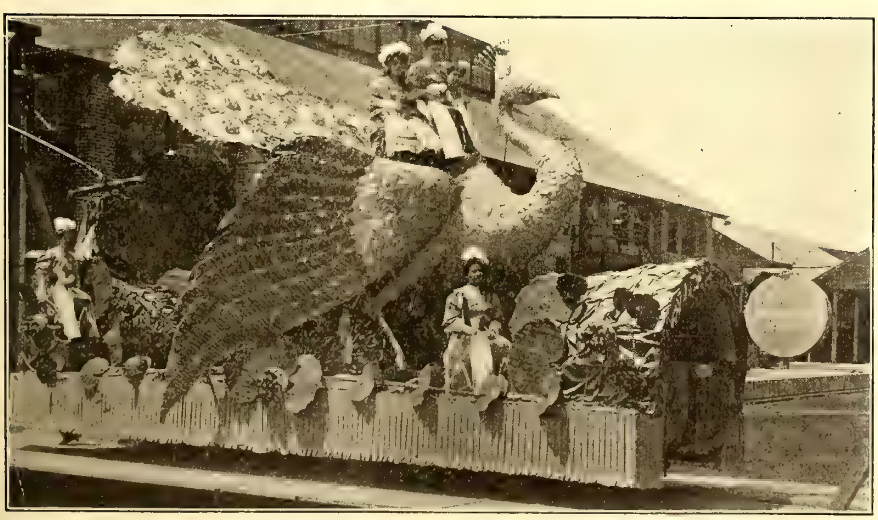


FIG. 3.—THE GIANT ELECTRIC PEACOCK IN THE LOS ANGELES PARADE

Then for a few years the Fiesta was allowed to lapse until revived by the Merchants' and Manufacturers' Associations and other civic bodies, who conceived the idea that the Fiesta with its gorgeous street displays day and night, of floral combination with electrical effects at night, would afford much amusement and entertainment to the thousands of tourists who come here from all parts of the world. Last year the Fiesta was omitted in honor of the Exposition at St. Louis, but this year the Fiesta was grander than ever before. It was made up of six steel allegorical floats whose tasteful and liberal illumination was greatly admired. Four of these floats are shown in the accompanying illustrations, which give a fair idea of their daylight appearance, but of course can give no ade-

quate conception of their gorgeous showing when illuminated. The photographs were taken just as the floats were preparing to leave the car house. Fig. 1, entitled "Mars," shows a warlike charger garlanded with roses, accompanied by an escort of rather peaceful-looking, pretty girls. Fig. 2, which was called "The Transit of Venus," proved especially effective from a lighting standpoint, while Figs. 3 and 4 are rather imposing representations of "The Peacock" and "Eagle." All of these floats were mounted on trucks designed by Fawcett Robinson of the Los Angeles Railway Company, which takes great interest in the Fiesta.

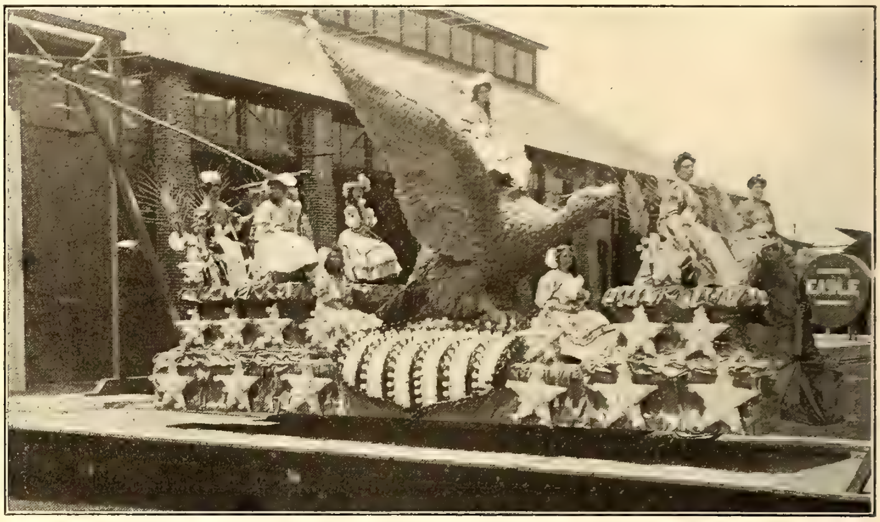
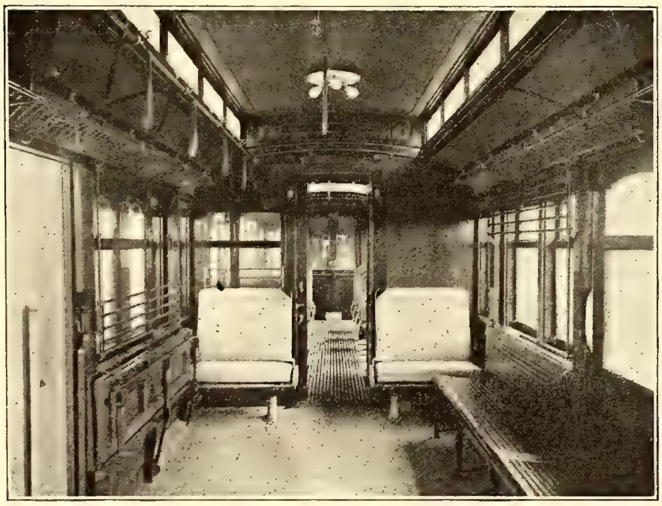


FIG. 4.—THE EAGLE FLOAT WITH THE STARS AND STRIPES

PARK IMPROVEMENTS AND NEW CARS FOR THE JOLIET, PLAINFIELD & AURORA RAILROAD

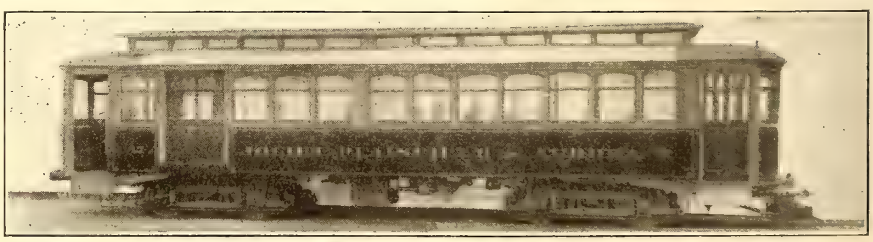
A number of handsome combination passenger and baggage cars, like the one illustrated, are now being shipped from the works of the American Car Company to the Joliet, Plainfield & Aurora Railroad. Four trailer cars of the same design and dimensions are also included in the shipment for handling this company's growing traffic.

Chief among the improvements made by this interurban road is the extending and beautifying of Electric Park, situated on the banks of the Du Page River at Plainfield. The charming surroundings and many attractions to be found at this popular resort were described in the Street Railway Journal of Dec. 24, 1904, and when the new features are added, Electric Park will be as attractive as any to be found in that section. Some distance down the river, the dam has been rebuilt, making nearly a mile of perfect boating, and all the usual amusements, including a summer theater, can be had. A unique feature of this park will be the camp grounds for the accommodation of those who wish to spend one week or the entire season on the grounds. On the eight acres of land reserved for the campers trees and shrubs have been planted and graveled walks laid out. On this site will be erected from seventy-five to one hundred canvas cottages which may be leased from the street railroad company for a nominal sum. These cottages have a permanent board and composition roof; board floor one foot above the ground; two feet of the side walls planked at the bottom and the balance of the side walls and gables heavy canvas, thus affording all of the open-air advantages of living in a tent without any of the disadvantages. Canvas-covered porches are provided and every facility offered in the way of gas for cooking and lighting, and as far as water and sanitary sewerage is concerned, people living in these tents will be as well off as their neighbors in the city. An immense dining hall is being erected for those who desire to escape the worries of the culinary department. On the west side of the river a large steel circular auditorium is being built with a seating capacity for 3000 people. A stage at the south end of the building will be fitted with every convenience for musical and other entertainments, and in addition a pipe organ is being installed. The lower floor of the building will be used for administration headquarters and the upper floor as a dining room and cafe. The auditorium has been designed with special reference to Chautauqua purposes, and will be utilized as a mercantile exhibition hall for the Plainfield township fair.



BAGGAGE COMPARTMENT OF JOLIET CAR

To facilitate the handling of the heavy traffic at the park, the company has installed a loop switch and additional sidetrack and platform, with a subway under the tracks into the park, so that all the loading can be handled on the one platform and all the unloading on another, which will result in no passengers being obliged to cross the tracks at grade. In addition to the features mentioned, the company will expend between $20,000 and $30,000 for other ornamental and decorative purposes. About 8 miles of new 400,000-circ. mil feeder cable has been installed to enable the company to satisfactorily handle the new equipment, and this season traffic returns are expected to double those of last year. Since last season the company has placed in operation a complete



COMBINATION CAR FOR THE JOLIET, PLAINFIELD & AURORA RAILROAD

United States electrical signal system to insure the safety of passengers.

Aside from the new cars now being delivered by the American Car Company, the regular equipment of the Joliet, Aurora & Plainfield Railroad is of a very high standard and of the same builder's manufacture. The railroad company is especially enthusiastic over the parlor car "Louisiana," which was purchased from the American Car Company at the World's Fair, and which is of the Brill semi-convertible type. This car has been of great value in working up a class of traffic that they otherwise would not have had. Owing to the luxurious cars, the company's lines running out of Joliet and Aurora are the most popular for trolley parties. The company has made a special feature of excursion rates, and parties of ten or more can be carried very economically on the regular cars, and the rates are correspondingly low in chartering a private car. The company states that the public has given marked approval to the smooth flush panel, the inside finish of golden oak, and the attractive treatment of the ceilings, and in the ordering of additional equipment these specifications will be adhered to. These cars have carried as many as 186 passengers each without breakage or damage.

The new cars are fully up to the high standard set by their predecessors, and are the embodiment of elegance and comfort. Luxurious high roll-back seats with spring backs covered in leather are provided. The finish is the company's standard quartered golden oak, inlaid with white holly. The ceilings are of three-ply poplar tinted a light green and delicately traced. The etching on the glass of the top sash lends an added touch of luxury. The end transoms have removable frames in which is set flashed glass of a deep blue shade, bearing the name of the railroad company in white etched letters. Continuous basket racks of bronze are installed, and there are additional fittings such as hot-water heaters, a thermometer to insure an even temperature in winter, and a saloon with dry hopper and water cooler. The folding doors in the vestibules are operated by the Brill system of control. The baggage compartments in the cars embodying this feature present a very substantial interior. Two high-roll back seats of rattan are provided at the end next to the passenger compartment, and the longitudinal seats are arranged to fold up when not in use.

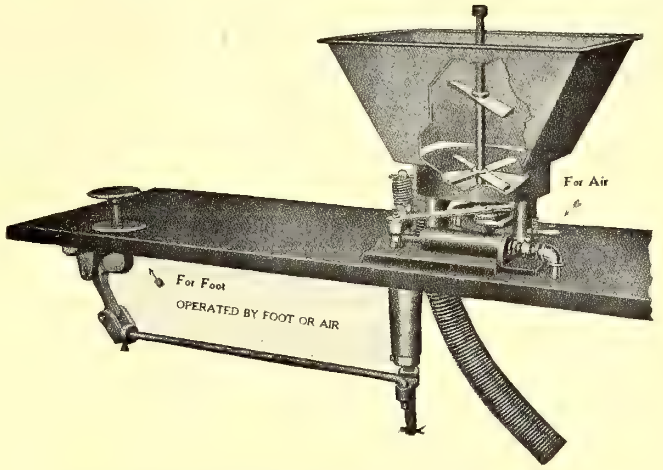
The chief dimensions in each type of car are identical and are as follows: Length over the end panels, 36 ft., and over the vestibules, 46 ft.; width over the sills, 8 ft. 8 ins.; width over posts at the belt, 8 ft. 9¼ ins.; centers of the posts, 2 ft. 8 ins.; height from the floor to the ceiling, 8 ft. 4¾ ins.; height from the track to the under side of the sills, 2 ft. 10¼ ins.; height from the under side of the sills over the trolley board, 9 ft. 5¼ ins.; height from the track to the platform step, 1 ft. 6¾ ins.; size of the side sills, 5 ins. x 8 ins.; size of the end sill, 5 ins. x 7 ins.; width of aisle, 36 ins. Both types of cars are mounted on No. 27-E1 trucks having a wheel base of 6 ft. and an axle diameter of 4½ ins. Four 40-hp motors per car are installed. Numerous of the builder's specialties are employed, such as angle-iron bumpers, "Dumpit" sand boxes, "Retriever" bells, "Dedenda" alarm gongs. The weight of the passenger and baggage car without motors is approximately 31,500 lbs.; that of the trail car, 30,000 lbs.

The Canton Board of Public Service has decided to make a test case of the law requiring street railway companies to sprinkle their tracks in municipalities. The Canton authorities have decided to do the sprinkling themselves, and will then attempt to place the amount on the tax list of the Canton-Akron Railway Company. In this way the effectiveness of the law will be tested.

AN EFFICIENT SANDER

Many attempts have been made to produce a satisfactory device for sanding rails, and many failures have been recorded in the past as the sanders proved able to work only in sunny weather and with dry sand. Unfortunately these ideal conditions do not always exist.

The accompanying illustration shows the Simmons-Moore sander manufactured by the Dayton Manufacturing Company, of Dayton, Ohio, which believes that this sander will prove equally reliable under all weather conditions. A metal hopper of any size to suit the space for holding the sand is placed beneath the car seat or other convenient place inside



PART OF SAND-BOX BROKEN AWAY TO SHOW OPERATING MECHANISM

of the car. The sander can be easily operated by hand, foot or air. By the first two methods motion is transmitted from the vestibule to the sander by means of the iron rod which extends underneath the floor line of the car to the sander.

If operated by air, an air-pipe line is run from the vestibule back to the sanding machine and connected to the air valve as shown in the illustration. When the air is applied the pressure causes the small piston to travel across the length of the cylinder placed at the base of the machine and the piston is connected to the mechanism to allow the sand valve to open and permit the sand to flow. The sand will then be emitted in a continuous stream as long as the air valve remains open. If dry sand cannot be obtained, then it is well, when using air, to open and shut frequently the air valve which causes the blades to revolve, stirring and aerating the sand as they turn around. At the same time that the valve opens, a metal finger reaches up through the opening and pokes the sand which lies nearest the opening, forcing the same to feed. Similar results are obtained when raising and lowering the foot when the foot pedal is used. The sand is conducted to the rails through a heavy wire hose.

Since the sander and the sand-box are located under a seat on the inside of the car, freezing weather in no way affects its operation. Also when cars are scrubbed out, water cannot run into the hopper and wet the sand. The sand cannot pack, as the revolving blades and the finger above mentioned effectually prevent it from packing or sticking and permit the use of comparatively damp sand. The mechanism is very positive in its action so that no sand is wasted between applications, and the quantity to be delivered can be regulated to have a large or small stream of sand flow as required.

Since the entire equipment is shipped ready for use, it can be installed by an ordinary workman in a short time, without in any way marring or injuring the car. All the various

parts are exceptionally strong and durable so that after once installed, the equipment requires little or no attention and it will deliver the sand as long as sand remains in the hopper. Among the railway companies which are using this sander with good results are: The Columbus, Urbana & Western Electric Railway; the Scioto Valley Traction Company; the Columbus, New Albany & Johnstown Traction Company, and the Columbus, Delaware & Marion Railway.

AUTOMATIC DEVICE FOR FILLING ROTARY BROOMS

The Columbia Machine Works & Malleable Iron Company, of Brooklyn, N. Y., is manufacturing an improved table for automatically inserting reeds in rotary brooms, sweepers, brushes and the like. The top of this table is divided lengthwise in two hinged portions. One of these is fastened securely to the table supports while the other is left free to tip over the stationary part as shown in one of the accompanying illustrations. Each table leaf has at its outer edge a flange upon which is placed a wider strip of sheet metal. These

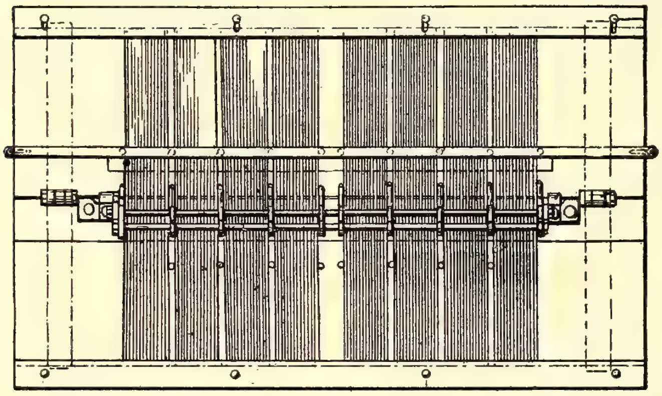


FIG. 1.—SECTION FRAME AND REEDS IN POSITION ON TABLE

strips are slotted transversely to receive nutted bolts which extend through the flange and table top. By loosening these bolts, the metal strips can be slid to project inward from the flanges or they can be slid outward to coincide at their inner edge with the inner edge of the flanges.

The reeds are first laid across the table, the metal strips being slid outward to facilitate this step and then afterward slid over the ends to hold them in place. A section frame of a broom is then laid along the table upon the reeds and is secured at opposites ends outside of the reeds. The section frame, as shown on the table in Fig. 1, consists of transverse

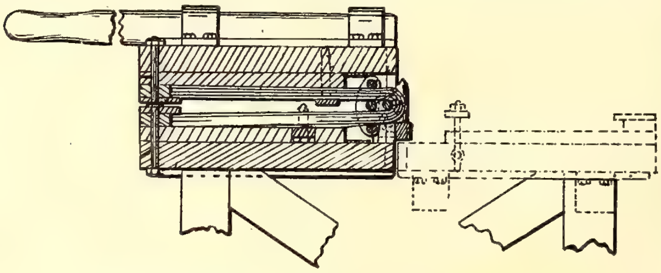


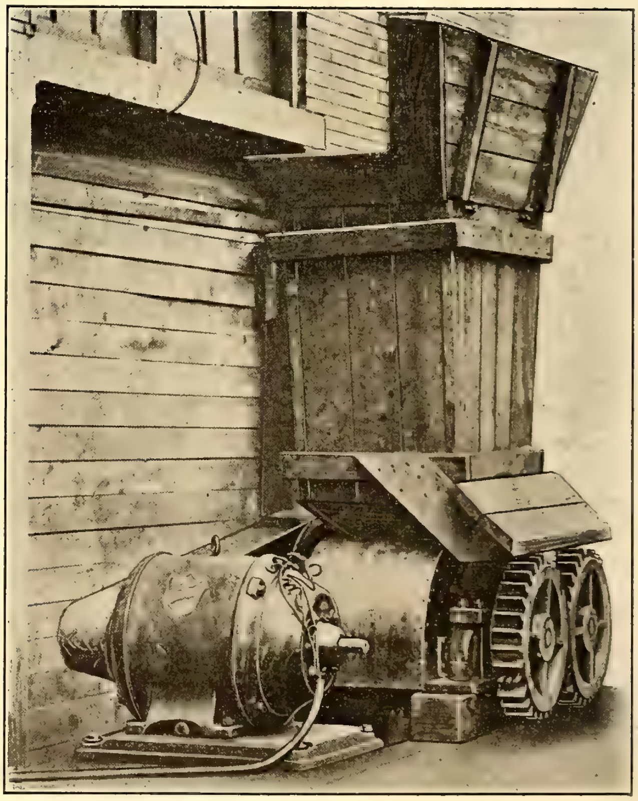
FIG. 2.—TABLE SWUNG TO BEND THE REEDS

plates arranged at suitable intervals upon connecting rods threaded at their ends to receive nuts. When placed upon the table the side rods are removed, and of the remaining two rods, one is adapted upon the removal of its end nut to be inserted in adjustable brackets upon the table top to hold the section frame in place. The frame having been locked and its plates separated the reeds into groups, an auxiliary holding-strip is applied to the swinging section of the table. This strip has teeth placed at distances equal to the distances between the plates of the section frame, and in applying the holding-strip the teeth are inserted into the divisions between the groups of reeds close to the frame plates. The entire holding-strip is then drawn outward upon the swinging section of the table to where the latter is provided with a series of sockets for receiving the teeth. The ends of the holding-strip project beyond the ends of the table and are locked to fastening bolts thereon.

The stationary section of the table has also a fixed row of teeth, spaced like those in the holding-strip and the plates of the brush-section frame, which serve to divide the reeds in groups as they lie on the table at the beginning of the operation. The swinging section of the table is next turned over as shown in Fig. 2. This naturally bends the reeds around the rods of the broom-section frame into their proper relative positions. The side rods of this frame are then pushed endwise into place in the perforated plates and afterward the metal strip of the swinging section of the table is released from the ends of the reeds and the swinging section returned to its original position, leaving the broom section properly filled upon the stationary table.

MOTOR DRIVE FOR COAL CRUSHING ROLLS

The accompanying illustration shows a set of 24-in. x 30-in. Allis-Chalmers coal crushing rolls, belted to an electric motor. In connection with furnaces at which automatic stokers are used, or where for other reasons it is desirable



MOTOR DRIVING COAL CRUSHER

to have the coal crushed to a uniform size, the advantages of such an arrangement will be readily apparent. The coal, as it is unloaded from the car, is passed through these rolls and drops to the hopper which feeds the stokers. Where it is possible to secure coal in hopper cars at all times a further improvement is made by placing the crushing rolls beneath the track, allowing the coal to drop from the car into the

rolls, and falling from there to the stoker supply hopper. Motor drive is the most satisfactory for an equipment of this character, as such rolls are in operation for a limited time only each day; there is therefore no waste of power and no idle belts or extra shafting to be cared for while the rolls are not in operation.

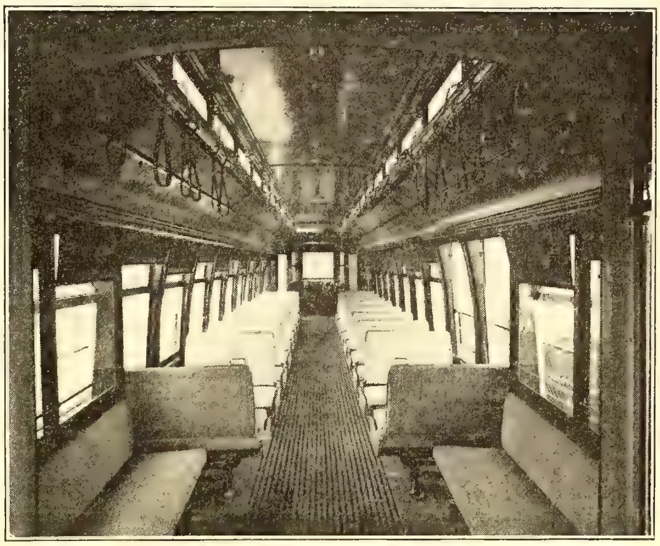
The Allis-Chalmers Company is now manufacturing a full line of these rolls, which are used not only for crushing coal, but also rock salt, phosphate rock and other similar materials that do not require the heavy machinery furnished by this company for mining work and the crushing of harder materials. It also builds the motors by which the rolls are driven.

SEMI-CONVERTIBLE CARS FOR THE BOSTON SUBWAY

The Old Colony Street Railway Company of Boston has placed on its elevated and subway lines forty cars of the grooveless post, semi-convertible type built by the J. G. Brill

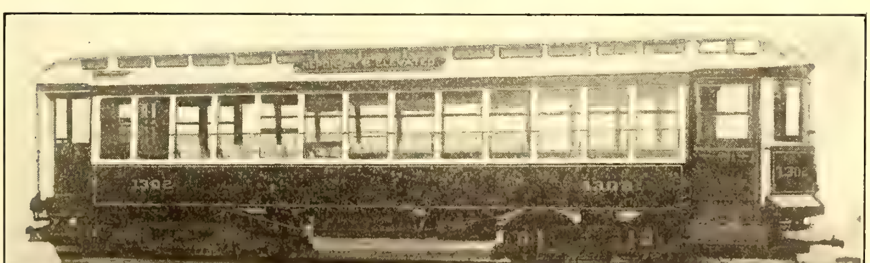
END VIEW OF BOSTON SUBWAY CAR

Company. These cars are seated for fifty-two passengers, and the interiors have the usual appearance of cars of this type, with the exception that the posts are inclined a trifle to give the necessary clearance for the upper part of the car when in the subway and at the same time preserve the maximum interior width allowed. The width over the sides below the belt rail is 8 ft. 4¾ ins., while over the letter panels the width is 8 ft. 1¾ ins. The interior width available for seats and aisle is 8 ft. 1¾ ins., which, with 35-in. seats, leaves the aisle 27¾ ins. wide. A considerable number of passengers may therefore stand in these wide aisles without obstructing the passage, and in addition extra standing space is afforded at the ends, as longitudinal seats at the corners occupy the space of two windows each. The vestibules and entrances have a number of novel and interesting features. Reference to the interior view will show that the doors in the body ends are omitted. This arrangement allows a wide opening, and the width between posts being 50 ins., facilitates passage in and out but without weakening the construction. The windows between the door posts and corner posts have bronze vertical bar guards. The platforms are flush with the car floor and are 5 ft. 6 ins. from the end panels over vestibule



INTERIOR OF BOSTON CAR, SHOWING LONGITUDINAL SEATS AT THE ENTRANCE

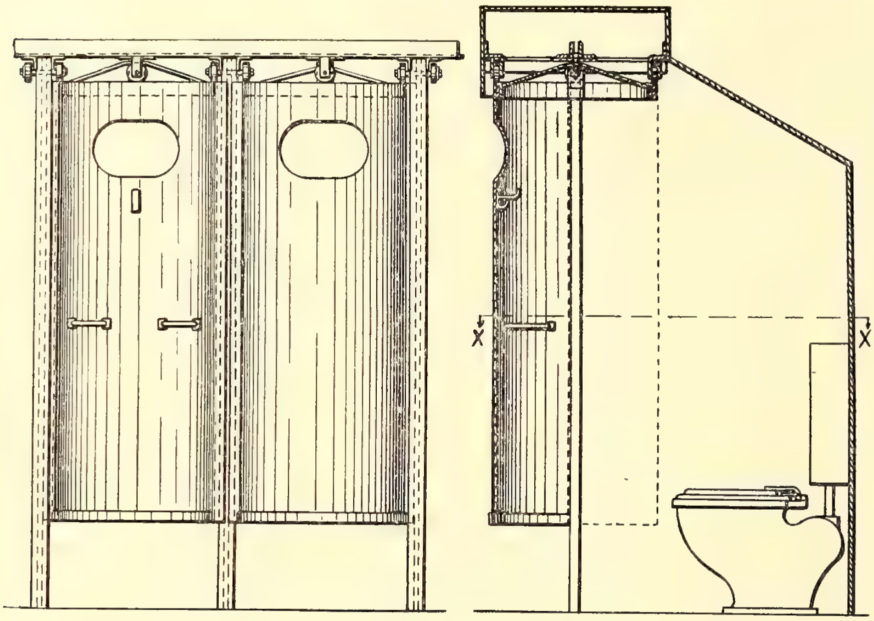
sheathing. The entrance doors are arranged to slide into pockets provided for them in the car body and are operated by air. The width of the door opening, measured between the vestibule corner post and the body corner post, is 38¾ ins. Access may be had to the door pockets by the window sashes back of the longitudinal seats. These sash are hinged, while the outer sash are stationary, the doors having double-sash windows with upper sash arranged to be lowered. A wire screen is provided to guard the opening. An interesting arrangement has been devised for the entrance steps, and consists of a pair of steps on each side of the platform, with the lower steps arranged to fold up; this is plainly shown in the view of the end of the car. The steps are folded in unison with the closing of the doors, and no foothold can be obtained on the upper step because the grab handles are inside the door. The grab handle against the vestibule corner post is the ordinary straight type except that it is extra long, while the handle against the body is curved from the



SEMI-CONVERTIBLE CAR FOR THE BOSTON SUBWAY

top of the step to the body door post. It will be seen that the bumper is provided with a shield to prevent persons from gaining a foothold thereon. The sliding doors and folding steps are operated by the motorman by means of a valve located near the air-brake valve, the power being furnished from an auxiliary tank connected with the air-brake tank. A compartment for the motorman is formed by the conjunc-

tion of two pairs of hinged doors which operate on roller bearings in a V-shaped runway. When not required to form this compartment, each pair of doors is snugly folded and secured to the vestibule corner posts of the platform. Suitable curtains for preventing the reflection of light from the



FRONT ELEVATION AND SECTION OF SANITARY CLOSET

inside of the car are provided. The vestibule ceiling is divided into two compartments for carrying auxiliary switches and train control device. The platform hoods are slightly curved up at the ends to make room for the destination signs and other lighting arrangements.

The framing of the cars is very substantial, and includes 4-in. x $7\frac{3}{4}$-in. side sills with 15-in. x $\frac{3}{8}$-in. sill plates. The corner posts are $3\frac{5}{8}$ ins. and the side posts $3\frac{1}{4}$ ins. thick. The radial drawbars are carried unusually low because of the step arrangements. The bar slide and draw plates are substantially attached and braced to the platform timbers. Other features will be seen in the engravings and need not be described. The general dimensions are as follows: Length over the end panels, 33 ft. 11 ins., and over the vestibules, 44 ft. 11 ins. The cars are all mounted on trucks of the No. 27-E$1\frac{1}{2}$ type, which have solid forged side frames with transoms secured to the side frames by forged double-corner brackets and heavy gusset plates. The ends of the frame extensions are bent around for extra clearance. The wheel base of the trucks is 6 ft. 4 ins., and the wheels are 34 ins. in diameter. Four 40-hp motors are used per car.

REAVES PARK IMPROVEMENTS

W. H. Schooley, manager of Reaves Park, on the line of and owned by the Toledo, Fostoria & Findlay Railway Company, in Ohio, is laying plans for the complete transformation of that resort this winter. The park has had a splendid run this summer, and the improvements planned for include a large figure-eight roller coaster, erection of dancing pavilion, a bowling alley and a number of other popular attractions.

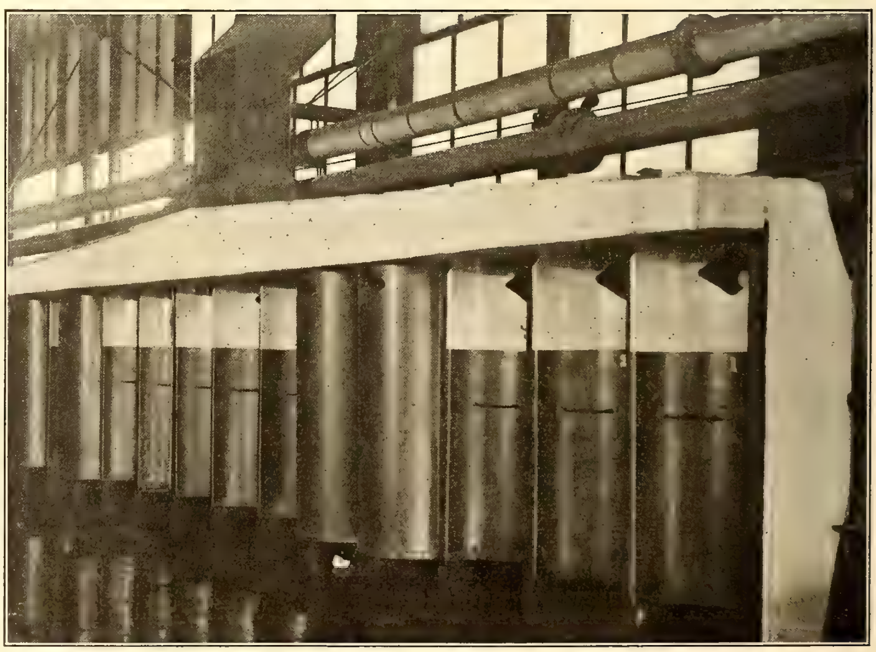
SANITARY CLOSET SHIELD

The Brown Hoisting Machinery Company, of Cleveland, has begun to manufacture for general sale a novel sanitary closet shield, devised by Alexander E. Brown. The set installed in the company's shops created so much favorable comment from visitors, that the company feels justified in expecting a wide sale for this important invention.

An installation consists of a series of stalls, or compartments, separated by concrete steel partitions (of the Ferroinclave construction), attached to light angle supports and covered by one concrete steel hood (also of the Ferroinclave construction), which runs to an apex about equidistant from either end partition. At this apex is a ventilating pipe. With the exception of the two ends, the partitions do not extend up to the hood, thus giving sufficient air circulation. As will be seen in the cross-section, the hood extends out over the doors.

The doors are hung from light angles, which extend across the partitions. These doors are steel plates, rolled in the form of semi-cylindrical shells. They are hung from the top, instead of from the side, and are so adjusted that in rotating on rollers they describe the path of a cylindrical shell about its vertical axis.

Among the advantages claimed for this type of construction are the following: A saving of space, practically 3 ft. being saved by this door, over the ordinary side-hinged style; the hood or ventilating system, taking away all odors, and the concrete walls, allowing easy cleaning with a hose; interior at all times closed to the outside view, thereby making it practicable to erect the closets at points in a building that



AN INSTALLATION OF SANITARY CLOSET SHIELDS, SHOWING VENTILATION AT THE TOP

would be too exposed for the ordinary types of closet in ordinary use. It can readily be seen by the door whether a closet is occupied, as in that case the door would be out. Another feature is that the semi-darkness of the compartments eliminates loafing.

FINANCIAL INTELLIGENCE

Wall Street, Aug. 22, 1906.

The Money Market

The money market developed a decidedly firmer tendency during the past week, rates for all maturities reaching the highest points attained for several months. Money on call, after loaning at 3 per cent early in the week advanced to 6 per cent, the average rate for the week being about 4 per cent. In some instances banks marked up the rate to 5 per cent on standing call loans. In the time money department rates ruled fully ¼ to ½ per cent above those prevailing at the close of last week, sixty-day money commanding 5¼ per cent, ninety-day 5½ per cent, four months' 5¾ per cent and five and six months at 6 per cent. For the longer maturities 6 per cent was freely bid, and while some small loans were made at that figure it was difficult to obtain any considerable amount at that rate. The higher charges are due to the increasing demand for money both in connection with the enormous dealings in and higher prices for stocks, and in connection with the general business requirements. The demand upon the banks at the inland cities for funds for crop moving purposes has also been larger, and although the outward movement from this center has so far been small, there is no disposition on the part of bankers to offer time money with any degree of freedom. The local institutions are losing substantial amounts of cash to the Sub-Treasury, these losses amounting to upward of $4,250,000 since Aug. 17, and the surplus reserves of the banks are lower than at any corresponding period for the past six years. It is not expected, however, that money rates will go materially higher in the near future. There may be fractional advances in both call and time loans, as a result of the extensive operations in stocks, but such advances would doubtless be followed by a fall in sterling exchange rates to a point where gold could be readily secured in the European markets. Sterling exchange has already begun to reflect the higher rates for money, prime demand sterling declining to 4.84½, a rate which makes gold imports permissible. At the current rates of exchange, however, local bankers are compelled to restrict their purchases of gold to the open market in London, and it is considered quite likely that they will be bidders for the $5,000,000 gold arriving at that center from South Africa early next week. Relief may also be expected from the Secretary of the Treasury in some form, should the situation require such assistance. The European markets have been about steady without material change in rates for money or discount.

The bank statement published on last Saturday showed a contraction in loans of $5,175,900. Cash decreased $3,457,100, or considerably more than the preliminary estimates. The reserve required was $2,287,075 less than in the previous week, which, deducted from the loss in cash, shows a decrease in the surplus of $1,170,025. The surplus now stands at $7,101,500, as compared with $9,355,675 in the corresponding week of 1905, $58,613,075 in 1904, $21,058,300 in 1903, $9,743,350 in 1902, $18,148,100 in 1901 and $20,557,050 in 1900.

The Stock Market

The sensational feature of the stock market during the week was the upward movement in the Harriman stocks, influenced by the announcement that the dividend on Union Pacific had been increased to 5 per cent semi-annually, and by the declaration of an initial semi-annual dividend on Southern Pacific of 2½ per cent, which places this stock on a 5 per cent basis. Other favorable influences included rumors of a probable increase in the dividend rate on Atchison, Louisville & Nashville, Pennsylvania, Amalgamated Copper, Chesapeake & Ohio and Norfolk & Western, and the resumption of dividends by some of the industrial companies, especially the railway equipment concerns, all of which are doing an enormous business and making large profits. Overshadowing all, however, was the movement in the Harriman stocks, and this resulted in a broadening of the speculation and an increase in the volume of trading. There was much unfavorable comment based on the increase in the Union Pacific dividend rate, on the ground that no official announcement was made until after the opening on Saturday. This was explained by the management as due to a desire to prevent London from benefiting marketwise from such information. The dividend on Southern Pacific was larger than had been expected, but the earnings of the company fully justify the payment of 5 per cent, and there does not appear to be any reason why such payment should not be continued. The stimulating influence of increased dividends was helped by announcements that the St. Paul will issue $23,000,000 of new stock to which stockholders may subscribe at par; the Northwestern will issue $100,000,000 of new stock, and the Norfolk & Western also will increase its capital. As all these new issues will carry "rights" for the stockholders, they influenced considerable buying, and this broadening of the market has already attracted a large outside interest, and commission house business has increased. It has been demonstrated that the controlling interests can create a bull market and advance prices in the face of what had been regarded as unfavorable political and monetary conditions. These, however, are offset by the unprecedented activity in general trade, by the outlook for large crops of grain and cotton, the enormous demand for iron and steel, activity in building operations, and the general prosperity of the country. Railroad earnings are simply enormous, and the annual reports now coming to hand all reflect this in largely increased earnings.

The local traction stocks developed no special feature. There was active trading in Brooklyn Rapid Transit at higher prices, and the rebate fare tickets now being issued to Coney Island passengers have had a beneficial effect. The disturbances have ceased, and what threatened to cause a very serious decrease in the earnings of the company has been averted. The question of the legality of the 10-cent fare will now go to the higher court, but no decision can be expected until late in the year.

Philadelphia

The local market for traction issues was somewhat broader during the past week, and although the dealings did not develop large proportions, the tone was decidedly firm. Philadelphia Rapid Transit was the only issue to display activity, upwards of 3000 shares changing hands at prices ranging from 30 to 31 and back to 30¾. Philadelphia Traction held firm at 99, and Union Traction brought 64 and 64¼. There was a better inquiry for the investment issues. A small lot of Thirteenth and Fifteenth Street sold at 304, and United Companies of New Jersey brought 256½. United Traction of Pittsburg preferred sold at 51, and 150 shares Consolidated Traction of New Jersey changed hands at 78¾ and 78½. Other transactions included 400 Philadelphia Company common at 50½ and 50⅛, the preferred stock at 50, United Railway Investment at 68⅞, American Railways at 53⅞ and 54, and Fairmount Park Transportation at 15⅞ and 16⅞.

Baltimore

The market for tractions at Baltimore was quiet but firm. Dealings were principally in the United Railway issues, all advancing fractionally. The free stock sold to the extent of 700 shares at 15, while the certificates representing stock deposited sold at 15¼ for about 900 shares. The 4 per cent bonds were fractionally higher, $25,000 selling at 91¾ and 92. The free incomes brought prices ranging from 70 to 71½ for $40,000, and $1000 deposited incomes brought 71. The new funding 5s were very quiet but higher, $5800 selling at 88¼ and 88¾. Other sales were: Lexington Street Railway 5s at 101½, Macon Street Railway 5s at 99¾, and Charleston Consolidated Electric 5s at 96.

Other Traction Securities

Dealings in the Chicago railway issues were extremely quiet during the past week, but prices generally held firm. Metropolitan Elevated displayed strength, 510 shares selling at 28 and 28½. Northwestern Elevated sold at 26, and the preferred at 66. Union Traction brought 5 for 300 shares, and the preferred sold at 16½ for 250 shares. North Chicago changed hands at 40. The unusual activity and sharp price fluctuations in Boston & Worcester stocks constituted the overshadowing feature of the Boston market during the past week. At the opening of the week the common stock sold at 30½ and later advanced to 33 on rather active buying, but at the close there was a reaction to 32. Up-

wards of 600 shares changed hands. The preferred was considerably more active, upwards of 7000 shares changing hands. There was strong buying during the first half of the week, which lifted the price from 81½ to 84⅛, but toward the close there was a reaction to 83¼ on profit taking. Massachusetts Electric issues also displayed considerable activity and strength, 1400 shares of the common selling from 20 to 20⅞ and back to 20⅝, while 2000 shares of the preferred sold from 70 to 72. Boston Elevated was quiet and practically unchanged, sales taking place at 149½ and 150. West End common sold at 95⅛ to 96½, and sales of the preferred were made at 109¼.

The appearance of the stock of the Forest City Railway Company, the new low-fare company, on the local exchange, was the feature of the week in Cleveland. The stock is a 6 per cent preferred, and it was put out at 90, and immediately upon listing was bid for at 93 with 95 offered. No transactions were announced and it was thought that the bidding was by insiders. Cleveland Electric sold steadily at 69½. Cleveland & Southwestern preferred sold at 58½ for a small lot, nearly 10 points below last sale. Lake Shore Electric sold at 16, also a fractional decline. Northern Ohio Traction & Light sold at 29¾, a trifle lower than last week.

There was little activity in Cincinnati. Cincinnati, Dayton & Toledo declined to 26¾. Toledo Railways & Light was active at 32½. Cincinnati, Newport & Covington common sold at 73½, a fractional advance.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Aug. 15	Aug. 22
American Railways	54	54
Boston Elevated	*149	150
Brooklyn Rapid Transit	76⅜	78
Chicago City	160	160
Chicago Union Traction (common)	4¾	4
Chicago Union Traction (preferred)	15	15½
Cleveland Electric	70	70
Consolidated Traction of New Jersey	78	78
Detroit United	92	95
Interborough-Metropolitan, W. I.	36½	37¼
Interborough-Metropolitan (preferred), W. I.	78¼	78
International Traction (common)	a55	54
International Traction (preferred), 4s	78	78½
Manhattan Railway	—	148
Massachusetts Electric Cos. (common)	19½	20
Massachusetts Elec. Cos. (preferred)	69	71
Metropolitan Elevated, Chicago (common)	28	26
Metropolitan Elevated, Chicago (preferred)	68	66½
Metropolitan Street	106	106
North American	95¼	94¼
North Jersey Street Railway	27	27
Philadelphia Company (common)	50¼	50
Philadelphia Rapid Transit	30	30¼
Philadelphia Traction	98¾	99
Public Service Corporation certificates	68	69½
Public Service Corporation 5 per cent notes	95½	95
South Side Elevated (Chicago)	96	96
Third Avenue	126	124
Twin City, Minneapolis (common)	112½	114
Union Traction (Philadelphia)	63½	64
West End (common)	—	—
West End (preferred)	—	—

a Asked. * Ex dividend.

Metals

According to the "Iron Age," the iron markets continue to outdo all August records, and in some lines all records for whatever month. The advance in pig iron prices has been carried farther in the past week, and the buying for 1907 has broadened. Steel-making irons for 1906 cannot be had in the Central West, though it is not certain that all Eastern producers are completely sold up. Rail orders are again coming in on a liberal scale, and structural mills are filling up. Wire mills, in spite of unprecedented sales, are in no hurry to mark up prices.

Copper metal continues firm at 18¾c. for lake, 18½c. for electrolytic, and 18¼c. for castings.

EARNINGS OF THE PORTLAND COMPANY FOR 1905

For the year ending Dec. 31, 1905, the Portland Railway Company, of Portland, Ore., earned a surplus equal to 10 per cent of the common stock. This good showing was largely due to the Lewis & Clark Exposition. However, it is reported that so far this year the earnings have fallen but little under last year, and it is believed the end of the present year will find the company's earnings nearly on a par with last year's. Under the new consolidation of the Portland utilities a great many economies will be effected, and it is stated that the management expressed itself as confident that 6 per cent will be shown for the Portland Railway Light & Power common stock this year. The 1905 statement of the Portland Railway Company is as follows:

Gross earnings	$1,843,563
Operating expenses	1,021,448
Net earnings	$822,115
Fixed charges	215,211
Balance	$606,904
Preferred dividend	125,000
Surplus	481,904

THE SAN FRANCISCO SITUATION

After several unavoidable delays the McAllister Street line has been placed in operation, and is carrying passengers from the ferry as far as the car house at Lyon and McAllister Streets.

The labor situation is showing signs of improvement, and the officials of the United Railroads say that there are now over 200 men at work and many others are expected in the city in a short time. The men who have been employed on the McAllister Street line will be at once put to work on the Sutter Street line, and it is expected to have the west-bound track of that line in order in a week at least. The opening of the McAllister line has afforded a great relief to the traffic to the new business section of the city, and the other track of the Sutter Street line will help still more. It is the plan of the officials to open all the lines possible running to the business section of the city. If the strike of the laborers engaged in the reconstruction work had not taken place, these lines would have been finished by this time. Work will also be started in the near future on the Sacramento and Jackson Street lines.

Howard Street, which has been closed for some time to traffic while the old tracks are being removed, and the regular street car tracks are being put in order, is being rushed for the use of the debris. It is now considerably over a week since any debris has been removed from the city, and the delay has been caused by the block on Howard Street. As soon as that is opened the work will at once start again, and the debris will be taken from the city in larger amounts than before.

The report of the Underwriters' Adjusting Bureau in the case of the United Railroads places the insurance loss sustained by the street railroad corporation at $437,067.64, of which the corporation itself contributes, under its coinsurance contract, $33,530.57, while the balance of $403,517.07 is distributed among eighty-eight insurance companies.

At a recent meeting of the Thirty-Ninth District Improvement Club resolutions were unanimously adopted calling for the installation of an overhead trolley on the Geary Street cable road. This action is significant, when it is considered that before the fire this club was strongly in favor of the underground conduit system. The earthquake and fire, however, changed the views of the members as to the desirability of such a system. Municipal ownership was also recommended. As both these propositions are favored by Mayor Schmitz, it is thought that the road will soon be changed over for electrical operation.

A trial trip has been made over the California Street cable line, and the road will soon be placed in operation. Cars will start at the ferry and go out California Street to Presidio Avenue, where transfer will be made to the lines of the United Railroads.

The new ferryboat "Contra Costa," of the Key Route line, has been taken from Dickie's yard at Alameda to the Union Iron Works to have her engines installed. As the machinery has been ready for some time, it is expected that the boat, which is to be a counterpart of the San Francisco, will be ready for service within a few weeks.

THE CONEY ISLAND SITUATION—EFFORTS OF PUBLIC OFFICIALS TO BENEFIT BY POSING

The truce that was declared last Wednesday in the Coney Island double-fare matter, which provided for the issuance by the Brooklyn Rapid Transit Company of rebate coupons pending the final decision of the courts in the matter, has relieved the situation, refusals to pay the second fare now being confined to a rapidly diminishing number of isolated cases. The arrangements for issuing the slips were perfected quickly, and on Saturday the company began to give out the coupons. On the same day service was resumed on the surface lines to the Island, cars having been stopped early in the week because of disorder.

As regards the question of carrying the cases to the courts, Attorney-General Mayer announced Tuesday, in Albany, through Deputy Attorney-General James S. Graham, that he had decided to apply for a permanent injunction restraining the company from charging more than a 5-cent fare on its Coney Island lines. This procedure is the one agreed upon by the company's attorneys and Borough President Coler, of Brooklyn. It is expected that a final determination of the fare question will be had at the October term of the Court of Appeals. For the purpose of preparing for the test case, George D. Yeomans, general counsel to the company, and Frederick B. Martyn, partner of Stephen C. Baldwin, Mr. Coler's attorney, met Tuesday afternoon in the offices of the company. After discussion the conference was adjourned without a decision. Mr. Martyn believed that as what was wanted was a decision as to the application of the railroad law to the situation, a single case, involving one of the roads controlled by the Brooklyn Rapid Transit Company, would be sufficient. Mr. Yeomans is said to have been of the opinion that an omnibus case, involving all the lines in the company's system, would have more satisfactory results. It is expected that the papers will be ready for the Attorney-General in a few days.

A distressing but humorous incident of the controversy was the anxiety of public officials "to get into the public eye." From Mr. Coler, the Brooklyn borough president, down to the police magistrates, this has been true with one or two exceptions. Mr. Coler has won for himself in the papers the title of the commoner. Police Court Justice E. Gaston Higginbotham also vied for public favor by committing Dow S. Smith, general superintendent, and A. W. Newbury, general inspector of the company, without bail, on the charge of inciting riot. After Mr. Smith and Mr. Newbury had been locked up in a cell of the court for three-quarters of an hour, they were taken by Sheriff Flaherty down to the County Courthouse, where a writ of mandamus, returnable forthwith, had been issued by Supreme Court Justice Jaycox, who released the prisoners in $2,500 bail each.

As for Mr. Coler, he became so frantic that Comptroller Metz felt called upon publicly to say that the Brooklyn Borough President should be put into the hands of a receiver. The Comptroller insists that Mr. Coler did urge him to "get into the band wagon," and become a popular hero like himself, and he intimates very broadly that the Borough President's passion for notoriety has degenerated into a craze. The Brooklyn "Times" says it must be admitted that many of the recent acts of Mr. Coler give some color to this assumption, and even said some of his acts and speeches during the late unpleasantness have been scarcely compatible with the presumption of sobriety and sanity. On Friday last the "Times" said:

"But, come to think of it, there has been a sort of epidemic of insanity in Brooklyn during the past week; there has been madness in the air ever since last Sunday. There is reason to believe that the wave of lunacy is subsiding, and that next week will see us all back to our normal condition, and wondering what insane root held our reason prisoner so long. Bird S. Coler was not the only victim. He had other distinguished companions in his frenzy. Justice Gaynor and Magistrate E. Gaston Higginbotham were among them, as well as the funny chap, Van Something, we think his name was, who tried to run the stalled trolley cars with a monkey wrench. Probably they are all properly ashamed of themselves now, and we may all decide to let bygones be bygones. If the Borough President does not develop any new and dangerous symptoms, the Brooklyn 'Times' would advise Comptroller Metz to give him another chance before moving for the appointment of a commission to inquire into his sanity."

The Brooklyn Rapid Transit Company has issued a statement warning the concerns that are accepting the rebate slips as equivalent to a nickel each that they are marked "not transferable," and that the restriction on the circulation of the slips will be adhered to if the Court of Appeals decides that a trip from Brooklyn to Coney Island is worth only a nickel. The company says that it will refuse to honor the demands of slip holders who appear with an unreasonable number after the court is heard from. "The Brooklyn Eagle," however, announced that it would continue to accept the rebate checks in payment for the "Eagle." If the courts decide against the Brooklyn Rapid Transit Company, the "Eagle" will give the extra 2 cents from each slip to the Newsboys' Home, of Brooklyn.

THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD DISPOSES OF ITS MASSACHUSETTS TROLLEY HOLDINGS

The New York, New Haven & Hartford Railroad has disposed of practically all of its Massachusetts trolley companies to several individuals, who have formed a voluntary association. The transaction includes the Springfield Street Railway Company, which was purchased by the New Haven road a year ago this spring. An important letter from President Mellen says that neither the New Haven road nor the Consolidated Railway Company holds any shares in the newly-formed voluntary association. This letter says:

> All the stocks and interests of every description heretofore held by the Consolidated Railway Company of Connecticut in Massachusetts street railways have been sold and delivered to a voluntary association, except the Worcester and Webster and the Webster and Dudley Street Railway Companies, whose lines are now and have been for some time, leased to the Consolidated Railway Company of Connecticut, by virtue of special authority granted by the Legislature of Massachusetts. The action of the Consolidated Railway Company in disposing of its holdings has been under consideration for some time. Neither the New York, New Haven & Hartford Railroad Company nor the Consolidated Railway Company is the holder of any of the shares of the voluntary association, to which the stocks and interests before referred to have been sold. The shares have been placed in the hands of a banking house for sale, and it is the hope and belief that they will in time become widely distributed.

According to information obtained at Boston, the transfer is said to involve the lines owned by the New Haven road in both Massachusetts and Connecticut, with connecting lines to Rhode Island and New York. A report from New Haven, however, indicated the probability that the Connecticut lines might not figure in the transfer, due, it was said, to the fact that under the charter of the Consolidated Railway Company, the holding company of the New York, New Haven & Hartford Railroad Company, such a transfer would be unnecessary.

For over three years the New York, New Haven & Hartford Railroad Company has been acquiring street railways in the State of Massachusetts, and recently the holdings of the company reached such proportions that the matter was made the subject of a special message by Governor Guild to the Legislature on the eve of its adjournment last June. Attorney-General Malone also interested himself in the matter and, acting in accord with the views of the Governor, he drafted and submitted to the Legislature a bill intended to prevent a continuance in this State of the control of the trolley car companies by steam railroad systems. A brief consideration of the matter by the legislative committee on street railways brought about the suggestion that a test case be made, and the Attorney-General set about preparing a case which would eventually receive a ruling from the Massachusetts Supreme Court. While this case was being prepared the Attorney-General, desiring certain information in connection with the car lines owned by the railroad, asked President Mellen, through Chairman Jackson, of the State Railroad Commission, to furnish it to him.

The information asked for by Mr. Malone was transmitted to him last Wednesday, and almost simultaneously the fact that the railroad company had transferred its holdings became known. Attorney-General Malone, when asked about the matter, said: "The facts are, that under the statute, I asked the Railroad Commissioners to get certain information from the New York, New Haven & Hartford Railroad as a preliminary to beginning proceedings against that company. The railroad company subsequently sent a communication to the Railroad Commission stating that the company had never held any stock in street railway companies, and that the Consolidated had disposed of the street railway stock which it had held. The Commission notified me of this reply."

THE NEW YORK, BOSTON & CHICAGO COMPANY OPENS OFFICE IN NEW YORK

The scene of action of the operations of the New York, Boston & Chicago Electric Railway, of which mention was first made in the Street Railway Journal several weeks ago, has been changed to New York. At least an office has been opened by the company at 20 Broad Street, in charge of Judge A. H. McVey, of the District Court of Des Moines, Ia., who as temporary vice-president of the company is looking after the affairs of the "most advanced project of modern times." Judge McVey was not discovered to be in the city accidently by the daily press. His coming was heralded in an advertisement in the Sunday papers outlying the project substantially as had previously been done in Chicago. On Monday, judging from the daily press reports, his time was given mainly to entertaining newspaper men. As a result there appeared in the papers on Tuesday morning long accounts of the project, written in anything but a serious strain. The questions put to the judge about capital and terminal facilities evoked evasive replies. The judge did say, however, that the problem of terminals in New York and Boston are difficult of solution. As for the Chicago terminal that would seem to be all arranged from what was said.

EARNINGS OF THE UNITED RAILWAYS OF ST. LOUIS

The comparative statement of the earnings of the United Railways Company shows an increase of $367,177 in the net income for the period from Jan. 1 to July 31 over the net income for the corresponding period of last year. The net income of July, 1906, shows an increase of $26,085 over that of July, 1905. The statement for the period from Jan. 1 to July 31 is: Gross earnings and other income, $5,194,488 in 1906, as compared to $4,772,949 in 1905, an increase of $421,539; expenses, taxes and depreciation, $3,218,045 in 1906, as compared with $3,150,853 in 1905, an increase of $67,192; net earnings, $1,976,443 in 1906, as compared with $1,622,096 in 1905, an increase of $354,347; charges, $1,387,347 in 1906, as compared with $1,394,177 in 1905, a decrease of $6,830; and net income, $589,096 in 1906, as compared with $227,919 in 1905, an increase of $361,177. The statement for July is: Gross earnings and other income, $794,220 in 1906, as compared with $726,861 in 1905, an increase of $67,359; expenses, taxes and depreciation, $493,762 in 1906, as compared with $451,674 in 1905, an increase of $42,088; net earnings, $300,485 in 1906, as compared with $227,919 in 1905, an increase of $361,177; charges, $198,026 in 1906, as compared with $198,840 in 1905, a decrease of $814, and net income, $102,432 in 1906, as compared with $76,347 in 1905, an increase of $26,085.

THE SITUATION IN CLEVELAND

The Cleveland Electric Railway Company and Councilman Hitchins, who introduced the recent low-fare ordinance for that company, but who later announced that he would not advocate the passage of the ordinance, have again come to an agreement, and a new ordinance was introduced for the company at the Council meeting Monday, Aug. 20. The company declined to accede to the Councilman's request for a reduction of fares under the plan adopted in Detroit of giving workingmen's tickets during certain hours, and the new ordinance continues as originally introduced, providing for seven tickets for 25 cents and 5-cent cash fares. Transfer privileges are more liberal than at first, giving passengers on cross-town lines the right to a transfer on a transfer, thus making the transfer privileges practically wide open. The company believes that this will increase the number of transfers asked for from 5 to 10 per cent. The new ordinance gives the city broader rights than the regulating of operation of cars, the compelling of proper ventilation and heating of cars and the sprinkling of tracks, and it also contains the clause giving the city the right to purchase the property at the expiration of the franchise term, providing the law at that time gives the authority to own and operate street railways. The most important change in the ordinance is that it provides for an extension of only twenty years instead of twenty-five years, as in the ordinance first proposed.

Other Councilmen now hope to gain fame through the settlement of the street car controversy, and are introducing new and ridiculous ordinances. One Councilman has a twelve-ticket for a quarter and no transfer ordinance, and having a ten-year revision clause in it, also a clause requiring the company to pay a percentage of its gross receipts to the city. Another ordinance would have the city lease the lines of both companies, permitting the old management to operate them and have them maintained from general taxes, everybody riding free. Still another Councilman will demand that the overhead trolley system be abandoned and an underground system adopted.

The Forest City Company will introduce a number of new ordinances at the Council meeting this week, and will endeavor to get them pushed through under the suspension of the rules. The Forest City Company is negotiating with the Cleveland Electric for a working agreement for the operation of cars through the Public Square and around a loop of one corner of the Square, where it is claimed free territory exists. If an agreement cannot be speedily reached the city will be asked to arbitrate the matter.

The Municipal Traction Company is now frankly announcing that it is opposed to the plan of submitting the franchise proposition to the vote of the people on the excuse that it aims to open up new territory not now developed, and with the assistance of Mayor Johnson it is sparing no efforts to have its ordinances pushed through the Council at the earliest possible moment, under the guise of extensions of existing franchises.

The Cleveland Electric Railway Company has declined to accede to the low-fare company's request for the joint use of the tracks to be laid on Fulton Street, the old company owning one track, while the new company owns the other. The old company operates cars only in one direction on this street, and has no need for a joint arrangement, while the new company expects to make it one of its main lines, and having no turn-outs it will be impossible for the low-fare company to operate in both directions on this street unless it can force the old company to make some concession.

The stock of the Forest City Railway Company was listed on the Cleveland Stock Exchange last week. The information furnished the exchange by officers of the low-fare company showed that a total of $750,000 was now outstanding. Of this, $100,000 was originally sold at par, the balance has been sold under the recent offering at 90, but of 6500 shares sold on this basis only 2000 shares have been paid for in full and issued, the balance were sold on the installment plan, and will be paid for at the rate of 20 per cent every sixty days. This makes the total fully paid up $300,000 par value, and $450,000 par value sold and partly paid for. The directors of the company are M. A. Fanning. R. A. Brown, C. H. Miller, John E. O'Brien, Thomas P. Schmidt, A. M. Willard, Otto Leisy and Leopold Einstein. The last two named directors, who are wealthy liquor men, are said to be the heaviest stockholders in the company.

THE BOONE, WEBSTER CITY & INTERURBAN RAILWAY ORGANIZED

The organization of the Boone, Webster City & Interurban Railway Company, of this city, was completed Aug. 15, 1906, by the filing of articles of incorporation with the Secretary of State of the State of Iowa. The articles state that the general nature of the business to be transacted by the company shall be the acquisition by construction, purchase or lease of a railway or railways connecting the city of Boone, Boone County, with Webster City, Hamilton County, Ia. The company begins business with a capital stock of $10,000, which will be used in making the necessary surveys and paying for other preliminary expenses. The capital will be increased as soon as the preliminary work is completed. The parties backing this new enterprise have already made arrangements with the officials of the Fort Dodge, Des Moines & Southern Railway Company for connections at Boone, both to Fort Dodge and Des Moines. E. E. Hughes, John S. Crook, J. H. Herman, J. C. Regan, John L. Goeppinger, Frank E. Sackett and M. J. Reilly constitute the board of directors. The officers are: E. E. Hughes, president; J. C. Regan, vice-president; John S. Crooks, secretary; J. H. Herman, treasurer. A preliminary survey has already been made. The final survey will be commenced in a few days. The officials want to have everything in shape for the letting of contracts for work sometime in the next two months. They desire to have a large part of the grading done this year. It is announced that bonds have already been placed.

E. E. Hughes, president of the company, has had much experience in railroad construction work. He was connected with the Northwestern Railroad Company at one time. Later, he was with the Davenport, Rock Island & Northwestern and the

Ozark & Cherokee Central. John C. Regan, vice-president, is president of the Regan Construction Company, of Des Moines, and has been building railroads for the past thirty years. John S. Crooks, the secretary, has had large experience in the buying of right of ways. The officers are, therefore, all experienced men in railroad building, and intend to push the work to an early completion.

SAN JOSE & SANTA CLARA COUNTY ELECTRIC RAILROAD

A prospectus of the San Jose & Santa Clara County Electric Railroad, of San Jose, Cal., recently issued, states that the system begins at Santa Clara, runs through the main business street to San Jose on the Alameda, the main residence avenue connecting the two cities. In San Jose the company has recently secured valuable additional franchises, all of which run for fifty years. The main additions will be immediately constructed in the city limits, insuring a very much better service than is now given. Leaving San Jose, the road runs through private right of way (recently purchased) to Alum Rock Park, via Berryessa, which is a very large fruit section with three canneries, employing over 1500 men. Alum Rock Park is a city park of the city of San Jose, situated about 7½ miles from the city limits. It is the only natural park with mineral waters, etc., in the Santa Clara Valley; an ideal resort. This line operates from Alum Rock Park canyon into the park, and effectually blocks the only feasible entrance into it. The proceeds of the bonds recently sold are to be used to standard-gage the entire property and rebuild it with 60-lb. T-rails, excepting in the city of San Jose, in which case the grooved or Trilby rails will be used. It is intended to give a double-track service to Alum Rock Park, which has now but a single track; also to thoroughly equip the property with the most modern and up-to-date cars.

REPORT OF THE KANSAS CITY COMPANY

The pamphlet report of the Kansas City Railway & Light Company for the year ended May 31, 1906, has just been made public. As compared with the previous year the earnings show as follows:

	1906	1905
Gross receipts	$5,153,168	$4,449,134
Operating expenses	2,596,539	2,235,260
Net earnings	$2,556,629	$2,213,874
Other income	9,671	16,588
Total income	$2,566,300	$2,230,462
Charges, etc.	1,644,524	1,501,862
Surplus over charges	$921,776	$728,600
Bond retirement	55,000	55,000
Balance	$866,776	$673,600
Dividends	476,105	476,105
Surplus for year	$390,671	$197,495
Previous surplus	266,680	69,185
Profit and loss surplus, May 31	$657,351	$266,680

General Manager Charles N. Black, in submitting his report to President Corrigan, made the following interesting summary of work completed during the season and the needs of the future:

"With the completion in March of the James Street viaduct, crossing the tracks of the Missouri Pacific and the Union Pacific Railroads, the last of the franchise obligations covering the construction of viaducts, bridges and extensions were complied with. This viaduct gives a direct connection between the business center of Kansas City, Kansas and the stock yards. Its full value, however, will not be realized until the electrification of the Twelfth Street cable line, when it will be possible and desirable to route part of the Minnesota Avenue cars, via the new viaduct, and the proposed Twelfth Street viaduct and tunnel, into the business center of Kansas City, Mo., and thus avoid all of the steam railroad crossings in the West Bottoms.

In Independence, Mo., a line running approximately 1 mile north and south of the public square, was completed and put into operation. This line acts not only as a feeder to the Kansas City & Independence line, but also takes care of a large amount of local travel in Independence.

"During the past year we have given careful consideration to our fire hazards, especially in connection with our car storage, and by the installation of sprinkler equipments in two of our largest car houses, have succeeded in reducing insurance premiums on our car risks more than 50 per cent. The completion of the new car house and storage yard at Forty-Eighth Street and Troost Avenue has enabled us to dispense with two of the old car houses, and in consequence we will be able to effect a further saving in our insurance premiums. Further improvements along these lines are contemplated for the ensuing year.

"In the fall of 1905 the company acquired the properties of the Kansas City & Westport Belt Railway Company, a steam railroad operating between Westport and Dodson. At the latter point connections are had with the Missouri Pacific, the Kansas City Southern, and the 'Frisco systems, from which railroads large quantities of freight, more especially coal and lumber, are delivered, consigned to parties in the southern part of this city. This road runs through a beautiful country, destined to be filled with handsome residences. All of the material for the electrification of the railroad has been ordered, and we expect to complete the work this fall. We will then be enabled to give a first-class passenger suburban service, and can reasonably expect a very large increase in the revenue from this property.

"During the past winter a franchise for a steam heating plant was secured from the city. Steam heating boilers were installed in the old Edison power house, located at Sixth and Wall Streets, and distributing mains were laid, covering practically the entire downtown retail district. Although the construction work was completed too late in the season to enable us to derive very much revenue from this enterprise during the past winter, it has enabled us to secure a considerable amount of lighting business, which, before we were able to furnish steam heat, was unattainable. We do not anticipate that this property will be very much more than self-supporting, but we do expect that it will be of material assistance to our lighting company in securing the lighting business of several of the large stores, which now have their own plants.

"Owing to the large increase in business of both the railway and lighting companies, additional power house and sub-station machinery was required. First among these additions was the installation of a 5000-kw Curtis steam turbine in the Missouri River power house, bringing up the capacity of this station at the present time to 15,000 kw. In our sub-stations we have installed during the past year two 100-kw rotary converters for the railway system, and one 750-kw rotary converter for the lighting company, and, in addition, a storage battery for the latter company, having a capacity of 750 kw for 1 hour. The value of this storage battery lies not so much in the additional capacity added to the system, as in the protection it affords against an interruption to the service.

"The enormous increase in the buildings, especially in the residential portion of the city, has necessitated the erection of 286.5 miles of additional overhead lines. Our street railway mileage has increased 4.92 miles of single track, exclusive of approximately 9 miles of single track of the Kansas City & Westport Belt Railway Company, in addition to which we have reconstructed 11.58 miles of single track.

"About the first of the year we placed an order for thirty new cars. Owing to delays on the part of the contractors for the electrical equipment, these cars, which we expected to receive by June 1, are only just arriving. In our own shops we have rebuilt seventeen old cable trail cars, which we are using for trail cars in connection with our heavy electrical equipment to handle our morning and evening service. These have proven most acceptable to the public, and will materially facilitate the handling of the travel during the congested hours.

"Early in the spring we discontinued the cable on East Twelfth Street, and are now operating this electrically. This leaves the west half of the Twelfth Street line as the only cable-operated road on the system.

"The large rate of increase in both the lighting and railway systems will necessitate considerable additional machinery to handle the business during the ensuing year, and in order to take care of this increase, orders have been placed for one additional 5000-kw Curtis turbine to be installed by Jan. 1, 1907, and one 1500-kw rotary converter for the lighting company. In addition, we will be obliged to order one 1000-kw rotary converter for the railway company, and from twenty-five to thirty new cars, to be delivery in the spring of 1907."

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED AUG. 14, 1906

828,322. Electric Railway; Charles J. Kintner, New York, N. Y. App. filed Jan. 11, 1906. A system for energizing the third rail sectionally during the passage of the train. A metallic blade is displaced by the wheel flange to close a relay circuit for energizing the rail section while the train is passing.

828,442. Brake-Shoe; James S. Thompson, Chicago, Ill. App filed April 6, 1904. A brake-shoe having a supporting back and a wearing face composed of asphaltum and comminuted iron and expanded sheet metal embedded therein.

828,442. Brake-Shoe; James S. Thompson, Chicago, Ill. App. filed Dec. 22, 1905. The brake-shoe has a cast iron body with a reinforced skeleton of wrought iron or sheet metal, which projects through the wearing face of the shoe.

828,347. Brake Shoe; William P. Taylor, Buffalo, N. Y. App. filed Dec. 23, 1905. Relates to modifications of the above and particularly to a construction of sheet metal inserts, which project through the wearing face of the brake-shoe at intervals thereof.

828,348. Brake-Shoe; William O. Taylor, Buffalo, N. Y. App. filed Dec. 22, 1905. A brake-shoe having a cast body and a series of separate inserts wedge-locked in said body.

828,386. Automatic Train Stop for Block Signal Systems; Fred. B. Corey, Schenectady, N. Y. App. filed March 10, 1904. In order to obtain a train stop which is effective at high, but not effective at low speeds, of the train, the patentee has provided an arm with considerable weight or inertia which is moved aside when the train is proceeding slowly, but which has sufficient inertia to set the air brakes when the train is going above a certain speed.

828,409. Roller Skate for Narrow Tracks; Adalbert Kazubek, Berlin, Germany. App. filed Nov. 30, 1904. A means of transportation over a single rail. Employs a pair of roller skates flexibly connected together and separated a distance corresponding to an ordinary step.

828,446. Electric Signaling Apparatus; George W. Watkins and Walter C. Bethel, Seattle, Wash. App. filed Jan. 23, 1906. The trolley pole carries a laterally projecting arm which makes contact with a number of depending blades, so that said blades are charged from the power circuit when the car passes. These blades are connected to signal circuits.

828,461. Switch Point Thrower; Henry T. Cline, Colorado Springs, Col. App. filed April 26, 1906. A swiveled blade is carried by the front platform of the car, and can be depressed into the groove of the rail when desired. The blade is then directed so as to throw the switch point.

828,489. Trolley Pole Controller; Milner Lidster and Joseph Hoellig, Los Angeles, Cal. App. filed Dec. 4, 1905. The trolley wheel is carried on a movable section at the upper end of the pole, and a rod connection is effective to operate a retriever cylinder whenever the upper section has an independent movement by reason of the trolley wheel accidentally leaving the wire.

828,518. Signaling System for Electric Railways; Charles E. Scribner, Jericho, Vt. App. filed Dec. 1, 1905. Relates to testing system for trolley road signals of that type having step by step actuated parts. The device is adapted to be positioned for the test circuit and for the signal circuits alternately.

828,536. Emergency Railway Brake; Phillip W. Counselman and Leroy M. Crockett, Toledo, Ohio. App. filed March 28, 1906. The ordinary brake-shoe is longitudinally channeled, and has a rod depending therethrough which can be manually depressed, when desired, to engage the track, thereby furnishing an emergency brake.

828,572. Snow and Ice Removing Apparatus; Joseph F. E. Rose, Montreal, Can. App. filed Oct. 9, 1905. Complete plan for a snow-plow car with a revolving cutter in front of each wheel, the blades of which are capable of being removed and resharpened whenever desired.

828,585. Circuit Closer for Trolley Signals; Horace Thurston, Providence, R. I. App. filed Jan. 2, 1906. A trolley signal of that type in which the trolley wheel strikes a tappet adjacent the trolley wire. Has a dash pot which provides for the prolonging of the signal when the car is moving at high speeds.

828,747. Sectional Third-Rail System of Electric Railways; Charles J. Kintner, New York, N. Y. App. filed Jan. 24, 1906. A system by which the third rail is sectionally energized during the passage of the car. Has a common current feeder or main connected to one pole of the power house generator, and switches operated by the electrical currents passing through the track rails and the axles of the car for connecting the common current feeder temporarily to the third-rail section.

PERSONAL MENTION

MR. MICHAEL McCORMACK, organizer and former president of the Sea Beach Railroad, died Friday, Aug. 17, in Brooklyn. Mr. McCormack retired from business twenty-five years ago to devote himself to railroad building. The Sea Beach road, the third steam road to Coney Island, was one of his first enterprises. He was one of the organizers of the New York Cotton Exchange.

MR. A. C. DENMAN, JR., has returned to San Bernardino, Cal., from an Eastern trip, and says he will again take up the active direction of the San Bernardino Valley Traction lines in a few days. It was reported that Mr. Denman had relinquished his position as manager of this system, after selling a controlling interest to Mr. H. E. Huntington. During the absence of Mr. Denman, Acting Manager Smith, of Los Angeles, was in charge of the system. Mr. Denman denies any connection with Mr. Huntington in any way whatever.

MR. H. C. REAGAN, superintending the erection and installation of electrical and steam machinery, also of sub-stations of the Pittsburg & Butler Street Railway, a Westinghouse single-phase road, over part of which three-phase is to be used, has been appointed electrical engineer of the company. Mr. Reagan will be in charge of main and sub-stations and the car equipment. Mr. Reagan held the position of chief and electrical engineer for several electric railroads, interurban and city, constructing engineer for the Appleyard lines, building the main power station and installing machinery at Medway, Ohio, three-phase, 26,000-volt transmission. Mr. Reagan also was chief engineer for the Cleveland, Painesville & Ashtabula Electric Railroad.

MR. A. W. JORDAN, who has been division passenger and freight agent of the Indiana, Columbus & Eastern Company, has been appointed acting general passenger and freight agent of the company, with jurisdiction extending over the traffic department of all the Schoepf lines in Ohio, except the Lima & Toledo. Mr. Jordan's duties will be the same as those of Mr. Walter Hurd, resigned. He will report direct to Mr. D. G. Edwards, vice-president and traffic manager of the company, with headquarters at Cincinnati. Mr. Jordan has had many years' experience in traction line work. He came to Columbus Jan. 1, 1905, and entered the service of the old Appleyard lines when they passed into the hands of the receivers and Theodore Stebbins was general manager. He has been connected with the lines ever since, and was one of the few men that were retained when the Schoepf syndicate took charge.

MR. GEORGE C. BLAKESLEE, general manager of the Albany & Hudson Railroad, will sever his connection with the third-rail system on Sept. 1. He will be succeeded by Mr. William Darbee, who is at present the gas expert of the New York State Commission of Gas and Electricity. Mr. Darbee is a graduate of the Stevens Institute, and was appointed gas expert of the State Commission in December, 1905. During the hearing of the Commission in New York and Syracuse he acted as the technical expert. Mr. Darbee was formerly the assistant general superintendent of the Connecticut Railway & Lighting Company, at Bridgeport, Conn. Previous to that time he had been superintendent of the Norwalk division. Mr. Blakeslee, the retiring general manager, has been connected with the Albany & Hudson for about seven years. He was at one time the vice-president of the road. He resides at Kinderhook, and will take a vacation before entering upon any other active railroad duties.

MR. W. R. DUNHAM, JR., of Providence, R. I., recently was appointed assistant engineer of the Consolidated Railway Company, which controls the electric lines acquired by the New York, New Haven & Hartford. Mr. Dunham's office is in New Haven, and he has supervision of reconstruction and maintenance in the territory east of New Haven as far as Worcester, and north of New Haven to Springfield. His railway experience was gained under the three chief engineers of the lines now operated by the Rhode Island Company—Mr. George C. Tingley, Mr. George B. Francis and Mr. Fred. N. Bushnell. Mr. Dunham was born in Providence in 1871, and after entering the Providence High School he spent two years in the office of Mr. J. A. Latham, from which he went to the office of S. B. Cushing & Company. In 1892 he was attracted by the possibilities of the electric railway, and obtained a position with the Union Railroad Company, of which Mr. George C. Tingley then was chief engineer. In 1902 he was taken from the engineering department to work out a system of transfer tickets, and in 1904 resumed his former position as engineer.

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Of this issue of the Street Railway Journal, 8,500 *copies are printed. Total circulation for* 1906 *to date,* 286,100 *copies, an average of* 8,175 *copies per week.*

Trolley Frogs and Troubles

Closely allied to the subject of trolley wheels, to which we alluded in a recent issue, is the proper erection of curves, switches and turnouts in the overhead construction. The importance of careful attention to these features is fully appreciated by the engineers of high-speed interurban trunk lines. The extension of city lines into interurban territory, however, is not always accompanied by due consideration of the requirements of high-speed service, and the standard urban construction which has previously sufficed is carried out into the surrounding country. A particularly frequent oversight is in the selection of trolley frogs not best adapted to the radius of curvature of the turn-out and the installation of ordinary city frogs with wide divergence angles and short pans. With such construction it is necessary to take each switch and turn-out at a very slow speed or have the trolley jump the trolley wire. A track switch with a record of one derailment a month would receive energetic attention and probably occasion "executive" correspondence between superintendent and track master. A few trolley wheels leaving the wire at the same place each day will aggregate much more in time lost, will give annoyance to perhaps thousands of passengers a month, and will create an undesirable sentiment in the community, yet will not be greatly criticised by any department because it only momentarily interrupts the schedule. As this continued petty annoyance to public and platform employees and the not infrequent overhead repairs directly due to it have been so easily avoided on a great many roads by the proper selection and location of trolley frogs, it is to be regretted that practical improvement in this direction is not universal. Simple rules obtained by trial and practice fix the best location and frogs with varying divergence angles, and different lengths of pans can be purchased in gradations which fit every class of service. The keeping of accurate and complete records of delays caused by trolley wheels leaving the wire can readily be obtained if the car crews are obliged to report the time and place of each occurrence. The weeding out of the bad spots is then a simple matter.

Branch Line Service on Interurban Roads

The kind of branch line service which it is desirable to give on interurban roads is a question of considerable local importance on some systems. On steam railroads it is almost without exception the case that the farther one gets from the main trunk lines the poorer the service grows in respect to quality of rolling stock, comfort in riding, speed and frequency of trains. Every change seems to be for the worse. It is usually accepted that with its relatively infrequent passenger, freight or mixed trains, a steam road cannot afford to give first-class service on a branch line, where the traffic density is far below that of the main routes. Consequently one may start out in a Pullman from a great terminal station in an important city entered by a steam road and bring up at night on a narrow-gage branch line of the same system in an antique car attached to the end of a milk train.

On a branch electric line the situation is entirely different. The rolling stock is almost always superior to some of that run in even fairly important main-line service on steam roads; cars are run once an hour in the vast majority of instances, against two or three times a day on the steam lines; and there is seldom much difficulty in making as good or better time than the branch steam train offers. The fares are usually high on the steam branch lines, and frequently mileage

books and other reduced rate transportation is not good upon them. There are therefore several excellent reasons why the electric line should capture most of the steam railroad's branch passenger business, and experience has certainly shown this to be the case. Very high speeds and fast schedules are not as a rule necesary on branch lines, but connections with the main line ought to be as carefully made as the schedules of the latter are punctual. It is much better to allow plenty of time for the branch schedule and connect with the main-line cars than to attempt speeds which are too great for the roadbed and track without excessive cost of maintenance and power. On many branch lines a maximum speed of 20 or 25 m. p. h. is ample for all the requirements of the territory, and the superior acceleration of the electric motor will do much toward maintaining a better schedule than the more or less antiquated steam locomotives of the branch can turn out. Thanks to the concentration of power generation and the continuity of its distribution on electric railways, the service on the different parts of the same system seldom varies as much as it does on a steam railroad, and this advantage of the electric road is easily pressed home to the local patron if he is given a thoroughly reliable schedule that is maintained from month to month with reasonable accuracy and economy of price.

Street Car Etiquette

A note on this topic bears a whimsical resemblance to the famous chapter on the manners and customs of the Fiji Islanders written by a returned sailor: "Manners, none; customs, beastly." One cannot take a trip on a crowded car in almost any large city without his mind instinctively reverting to Gulliver among the Wahoos. It is a case of the survival of the strongest relieved by no more compunction than Nature shows among her grim struggles—a five-o'clock reminder of the ferocity of the strife for the dollar during the eight previous hours. In every crowded city the case has gone year by year from bad to worse, until the situation in many cases has become fairly indecent and intolerable. It is no longer a question of the end-seat hog, but of the generalized, indiscriminate hog whose offensiveness is limited only by his activity. It is time for street railway managers and the public to take counsel together and to seek for means of relief. Evidently the natural courtesy of the average crowd cannot be counted on for assistance when the rush hour begins. At bottom the problem is dealing with extreme congestion of traffic, but thus classifying does not help the matter much. The diagnosis is clear enough—what we want is the remedy. In New York, for example, shops close and business ceases at or very near a prearranged hour, and the entire working population of the metropolis starts for home simultaneously. As it nears the cars it degenerates into something little better than a mob, a fairly respectable and well-dressed mob to be sure, but none the less insensate in its disregard of the ordinary amenities of life.

What can be done to help the situation? It is in New York and in most other cities physically impossible to run enough cars to handle the whole working population at once. The best course would seem to be two-fold—first to relieve the acute symptoms, and then to get as far as may be actively at the causes of the disease. As to the former matter, we would recommend first at certain points enough policemen with authority and willingness to make arrests for disorderly conduct, combined with co-operation on the part of the courts in the way of visiting punishment to the offenders when they are arraigned the next day. This course may seem drastic to some of our police justices, judging from their recent lenient treatment of similar cases, but offenses of this kind demand just that sort of treatment, and it would not take a long course of it to bring people to some sense of their mutual responsibilities.

Beyond this the most hopeful remedial measures would seem to be those directed toward lengthening the traffic peak. This can be done to a very material extent by keeping up the peak schedule before and after the terms of the ordinary peak. People soon learn that by shifting their hours very slightly they can be accommodated, and while many workers are held to definite times, the number who can get away a little earlier or later than the usual time is enough to help the situation. And in connection with this extension of the time of extreme schedule we are inclined to think that the often suggested plan of putting on platform gates and thus limiting the passengers allowed to board a car may have to be taken up by some roads which have not yet adopted this plan. With the schedule pushed to its utmost for a somewhat longer period, and a definite effort to lengthen the peak, overcrowding can be checked without injury to any one. Possibly something might be done through the various trade associations in an effort to scatter as it were the termination of the working day over a small extra period. Something, too, can be done by adroit routeing of cars so as to scatter traffic over more lines. The exigencies of the situation are such in every large city as to demand active work. You cannot reform the manners of an indiscriminate crowd, but it is at least possible to punish sheer brutality and in some measure to remove the causes that promote it.

Wire Locations on Pole Lines

Until one stops to consider the matter, it is surprising to find what a variety of circuits is usually carried upon the pole line of an interurban railway of sufficient length to use high-tension transmission and low-tension distribution. It is evident that the design of the pole line and the location of wires in such a case is a question of no little importance. On a representative road of this sort bare wires carrying potentials of 13,200 volts and upward for transmission, 600-volt feeders, trolley circuits, lightning arresters, ground wires, local lighting loads, telephone and signal wires must all be installed in such a way that they will not interfere with one another in any wise, or introduce excessive personal hazard into the work of the line maintenance crews.

The order of location which good practice considers desirable depends somewhat upon the use which the company makes of its transmitted power, and also upon the high-tension line voltage. In case a company does a combined railway, power and lighting business and is likely to wish to make frequent transformer taps along its route for local distributing centers, it may be a good plan to put the telephone and signal wires on the upper cross-arms, the high-tension circuits being run either in the middle or on the lower arms. With this construction the high-tension connections can be made freely without having to interfere with or pass relatively high-voltage wires up through the telephone and signal cir-

cuits. In cases where the latter are more numerous than the heavier wires, where the transmission voltage is not much in excess of 13,200, where the company sells large quantities of power at scattered points en route, and where extra long cross-arms are installed to permit a safer passage of linemen up the pole, there may be some cases where this construction will appear preferable to the plan of putting the higher voltage wires at the highest point above the ground.

The latter practice is certainly the better in the great majority of cases. Mechanically the high-voltage line is, or ought to be, stronger than any other circuit on the pole; it is much less liable to break and needs, as a rule, much less attention than either the feeders, trolley signal or telephone wires. High-voltage power lines for railway service generally run directly from the power plant to the sub-stations, and except in special instances it is not common for taps to be made in a railway transmission line for power outside sub-stations or special switching stations. There is no reason why low-tension direct-current feeders should not be carried below the telephone and signal wires if convenience serves that way, but the consensus of opinion at the present time favors placing dangerous wires above non-dangerous circuits. Of course, the installation of a large amount of heavy copper on the upper part of a pole line reduces the factor of safety against breaking strain, and calls for more substantial poles, cross-arms, pins and insulators, other things being equal. On a very high-voltage line, say from 30,000 to 60,000 volts, it is a grave question if the wisest plan is not to build a separate transmission line well beyond the reach of the low potential circuits. In most cases ground wires can be safely brought down the poles in iron pipes extending well into the earth, so that if a ground load breaks, the discharge will still be carried off in safety. A fair specification for an a. c.-d. c. wire location, proceeding from the top of the pole, is: Transmission line, 13,200 volts; d. c. feeders, 600 volts; telephone circuits, trolley bracket and tops, signal lines and local lighting circuits, 600 volts. On a single-phase alternating railway the problem of wire location is a much simpler one. If the catenary trolley carries full transmission potential, then the poles may be utilized in any convenient order for wire locations. In case the voltage is high enough to require transformers between the transmission line and the trolley, there is little doubt that the non-dangerous circuits should be placed well below the high potential wires. Thorough construction, inspection and maintenance are important, wherever telephone, signal and other small-wire circuits may be located.

Testing Motor Fields

When motor troubles arise and the cause is not at once apparent, the conclusion is often reached that the armature is at fault. In cases of undue sparking, flashing over between brushes and similar troubles, the armature is usually removed and tested. If the winding is found O. K., the person whose duty it is to locate the trouble often assumes that it is the commutator which is at fault; he turns this down or polishes it, and in addition may groove out the mica between the segments. The armature is then put back into the motor and the sparking is less severe than before, and although the motor does not run satisfactorily the car is put in service, only to be turned in within a few days because of the blowing of fuses. In some instances the sparking of motors is so severe that men are put on the road to clean and polish commutators, as it is found that by giving the commutators attention every few hours some of the trouble is avoided. During all this time the fact that the fields may be the cause of all the trouble is evidently forgotten. If proper attention were given to the testing of fields, it is safe to say that those mysterious troubles of motors that baffle solution would be fewer in number. Frequently attempts to test fields end in failure because the work is not done properly. Often attempts are made to test them with a voltmeter and an ammeter while they are in the motor. These tests are frequently unsatisfactory because not enough current is used to get an appreciable voltmeter reading or the current is not allowed to flow a sufficient length of time to heat the fields thoroughly. A heated field will often indicate the presence of shorted coils when the same field while cool and under a drop of potential test will show up O. K. When possible, coils should be tested while clamped in position in the motor, but if this is not possible and they are tested on the floor of the shop, pressure should be put on them when the readings are taken. Sometimes standing on them or jumping up and down on them will cause a variation in the reading of the voltmeter; if so, the chances are great that the field is defective. In addition to the drop of potential method with direct current, fields may be tested when out of the motor by means of a transformer. A special transformer is required built in such a manner that the field to be tested may be slipped over a core and be made to serve as the secondary of the transformer. A short-circuited coil in the field makes itself evident by an increase in the primary current, by the heating of the field and by the sound given out from the transformer. As with direct-current tests, it is best to apply pressure to the coil in order to develop any shorts that would occur if the field were thoroughly heated and clamped in position in the motor shell.

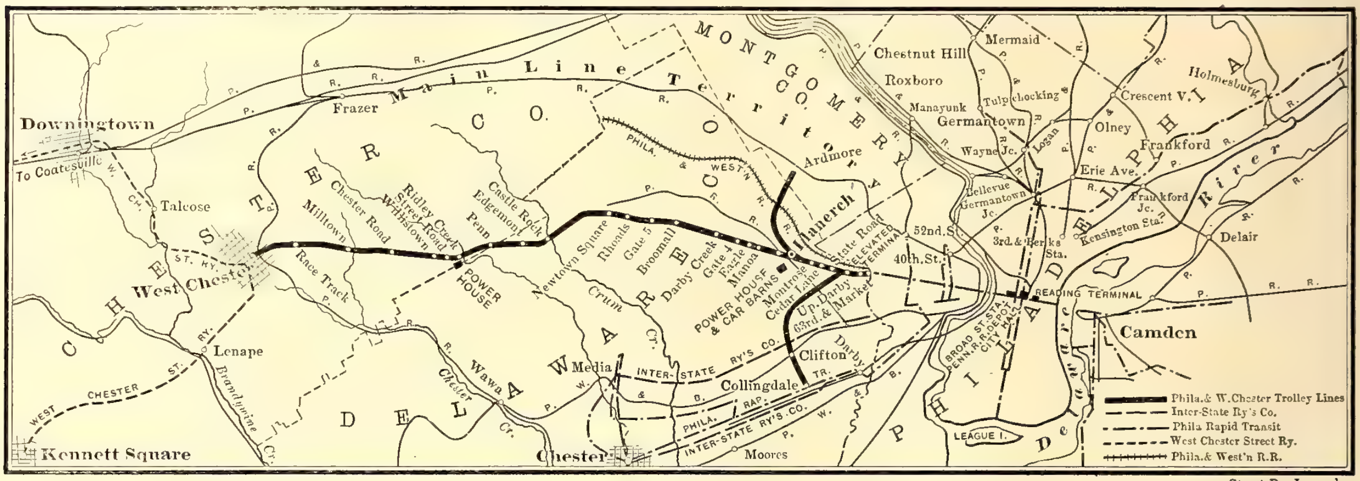
Several field coil testing devices especially adapted for testing fields while they are clamped in the motor have also been developed within the last few years. When properly used, these devices usually give good results and, further, the tests are made in a very short time. The machines are usually constructed on the principle of a Wheatstone bridge, a telephone or a galvanometer being employed to indicate when the known resistance is equal to the resistance of the field being tested. But in many instances where these instruments have been purchased, the shop man who is assigned to test the fields does not operate with the instrument long enough to get familiar with it. He seems to regard it as too complex to be understood. But if an earnest effort is made to test fields in this way it will not be long before satisfactory results can be secured. When the testing of fields is begun in shops in which it has not been carried on before, records of all tests should be kept and the condition of the fields when torn up should be noted. By so doing the proper resistance for a perfect coil may be obtained for each type of motor in use. When starting out, if there are no figures as to what the readings should be, the resistance of one field of the motor may be compared with that of another.

The difficulties in obtaining satisfactory results in testing field coils is no doubt largely responsible for the general inattention given them when the causes for the faulty action of a motor are being considered. But as there is such a great likelihood of the fields being the cause of motor troubles, certainly more attention should be taken to ascertain their condition whenever the trouble cannot be located elsewhere.

THE REHABILITATION OF THE PHILADELPHIA & WEST CHESTER TRACTION COMPANY'S PROPERTIES

Through the courtesy of the management of the Philadelphia & West Chester Traction Company, it is possible to give here considerable interesting and valuable data on various phases of modern high-standard interurban practice. A study of this particular property is especially interesting, as it is representative of a class of roads, which perhaps may be defined best by the term "rehabilitated properties." In other words, it is a noteworthy example of what can be done in making over a dilapidated, non-paying country trolley road, built a decade ago, into a successful, modern, interurban property. This making over of older systems and putting them upon a profitable basis in conformity with present-day standards, is a class of work that has attracted investment-seeking capital in the past and will continue to do so in the future.

Ventures of this nature usually offer attractive possibilities, but they bring to the front engineering and operative problems of their own. It is one thing to build a city or interurban electric railway, where the plans can be laid out completely from the first, according to later-day practice; it is quite another thing to take an older property, built according to earlier standards, or, as is all too frequently the case, built without regard to any standard or future requirements and with the old as a basis, produce an up-to-date property. Conservative financing requires that the original investments be not wholly disregarded and new investments must be made in proportion to the economies to be secured and the new business that will be created thereby. By analyzing some phases of the Philadelphia & West Chester Traction system, it is the purpose of this article to outline how certain important results have been achieved.



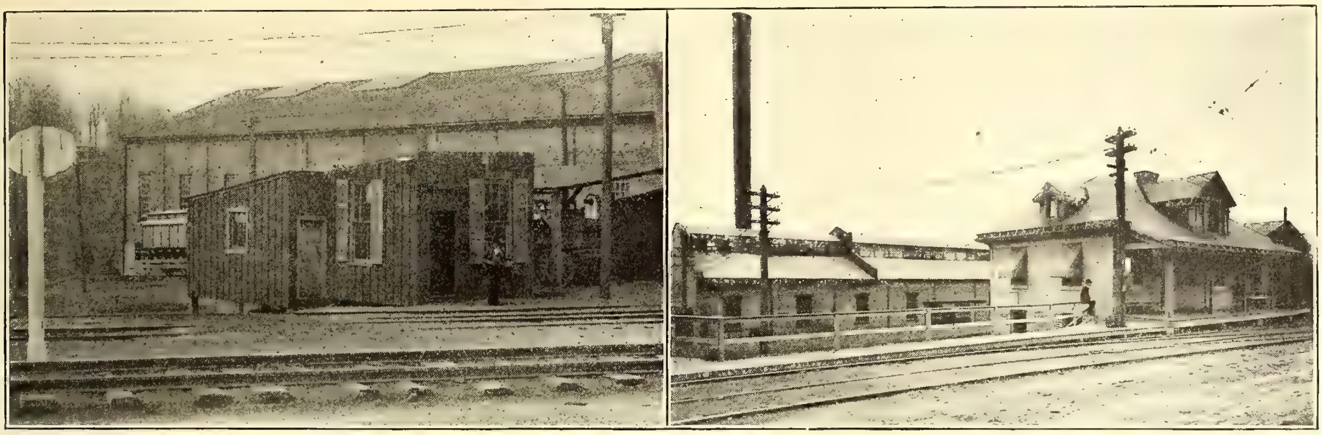
RAILROAD MAP SHOWING STEAM AND ELECTRIC LINES IN THE TERRITORY SERVED BY THE PHILADELPHIA & WEST CHESTER TRACTION COMPANY

ARTIST'S ELEVATION OF THE TERMINAL AT SIXTY-THIRD AND MARKET STREETS, PHILADELPHIA, TO BE USED JOINTLY BY ELEVATED TRAINS OF THE PHILADELPHIA RAPID TRANSIT COMPANY AND INTERURBAN CARS OF THE PHILADELPHIA & WEST CHESTER TRACTION COMPANY, AND PHILADELPHIA & WESTERN

THE OLD AND THE NEW

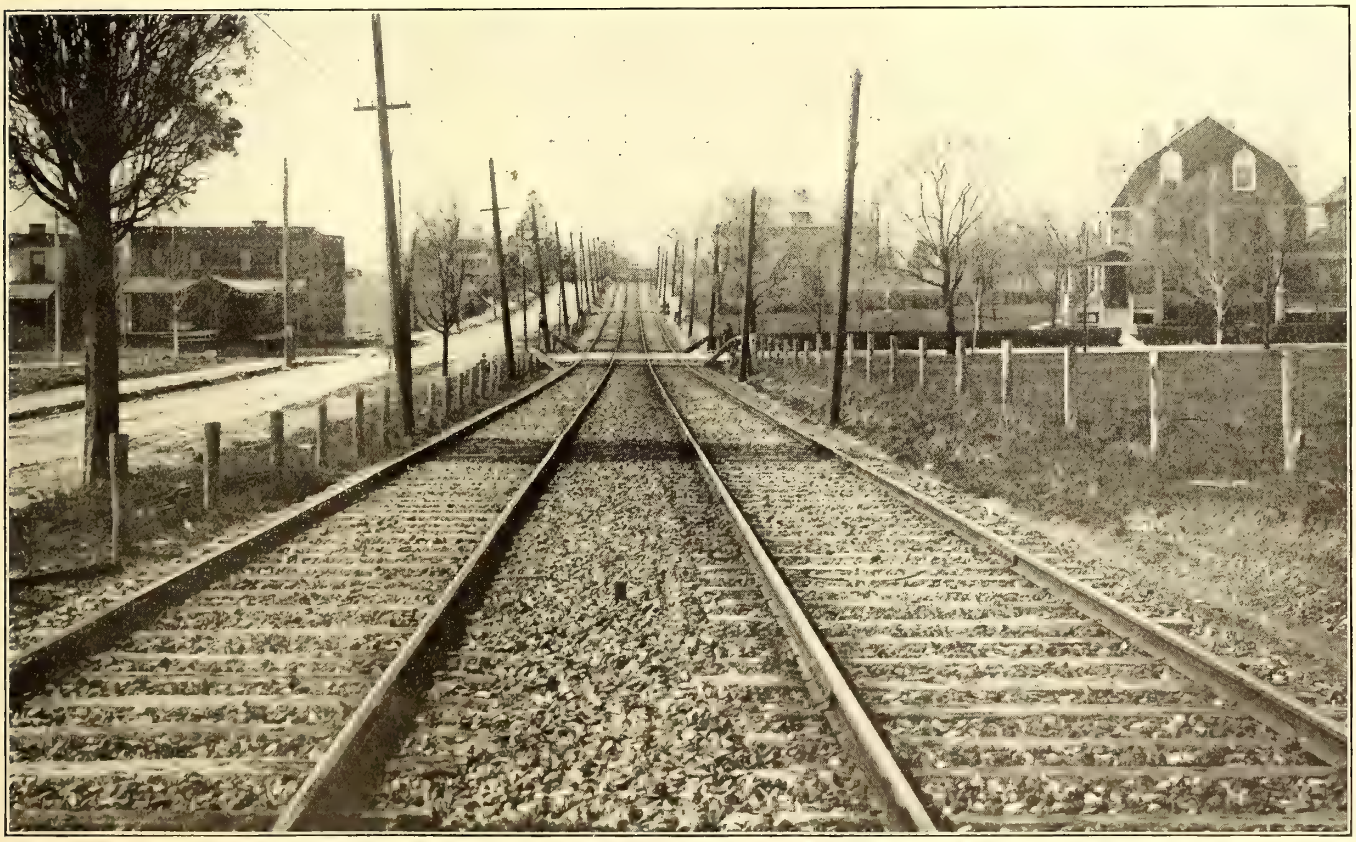
The original line was built along the West Chester turnpike, first as a mule line, then as a steam dummy line for a portion of the distance and afterward as a single-track electric road, extending from Sixty-Third and Market Streets, Philadelphia, to West Chester, a distance of 20 miles. The road passed into the hands of the present management in

1899, and the new company started in upon the reconstruction work and the building of extensions in accordance with certain well formulated policies. Briefly summarizing the net results as regards the physical property, the execution of these policies has, within the last two years, brought about the following changes:



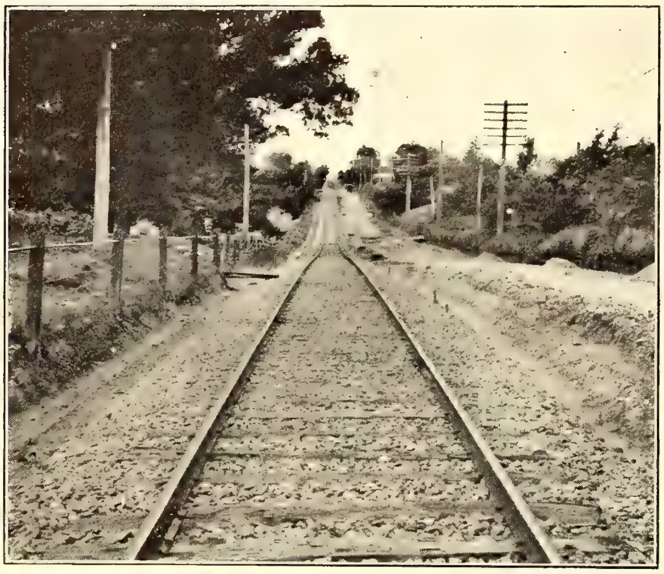
THE METAMORPHOSIS OF AN ELECTRIC RAILWAY. THE VIEW AT THE LEFT SHOWS THE OLD CAR BARN AND OFFICES OF THE PHILADELPHIA & WEST CHESTER STREET RAILWAY, THE "OFFICES" CONSISTING OF THE SHANTIES IN THE FOREGROUND. THE VIEW AT THE RIGHT SHOWS THE PRESENT SUBSTANTIAL OFFICES AND POWER HOUSE

The original West Chester line has been, as far as possible, rebuilt in accordance with the best "steam railroad practice." A portion of the line at the eastern end, where traffic is most dense, has been double-tracked. Careful attention has been paid to drainage. An efficient system of block signals has been installed, and the overhead construction and distributing system have been rebuilt and extended along ample lines. No. 0000 trolley wire has been substituted for the original No. 00 wire. The machinery in the original power house has been replaced by modern generating apparatus, to which extensions are now contemplated and a new power house has been built on the western end of the line, thereby increasing the power house capacity to permit of properly handling the large increase in business. New cars of the latest approved interurban type have been added and the schedules have been quickened. Attractive and comfortable way stations have been erected along the line. New car house, store room and office facilities have been provided and plans are now finished in the rough for a new shop and car house of ample capacity, which will be built of brick and reinforced concrete, thereby decreasing insurance expenses and cost of maintenance. A private telephone system, which connects all turnouts with the despatcher's office and all departments of the organization, has been installed and up-to-



A STRETCH OF DOUBLE TRACK ON THE PHILADELPHIA & WEST CHESTER LINE

date despatching methods have been adopted; a first-class accounting system has been established along the lines of the standard recommendations promulgated by the American Street and Interurban Railway Accountants' Association. New terminal buildings have been built, one at the terminal of the Ardmore branch and one, an elaborate layout, at a point 3700



TYPICAL SINGLE-TRACK CONSTRUCTION, SHOWING DRAINAGE DITCHES AND ROADBED

ft. west of Sixty-Third and Market Streets, which will be the main transfer point for traffic between the Philadelphia & West Chester Traction Company, the new Market Street elevated of the Philadelphia Rapid Transit Company, and the new Philadelphia & Western Railroad Company; the more important features of these improvements will be described later in this article.

TERRITORY SERVED

The Philadelphia & West Chester Traction Company operates 33.17 miles of track; the distance from Sixty-Third and Market Streets to West Chester is 20 miles; the length of the Ardmore division, which extends from Llanerch on the main line to Ardmore, is 3½ miles, and the length of the Clifton division, which extends from the eastern terminal to the borough of Clifton Heights, is 3.25 miles.

The territory served includes the most promising territory for moderate price residential purposes within the suburban district of the city of Philadelphia. Philadelphia cannot grow to the eastward, because of the Delaware River. There is little land available for development to the south, owing to

TYPICAL CONSTRUCTION AT A TURNOUT

low and marshy ground, and the city is built up solidly for a distance of 10 miles to the north. Therefore, the present great development of the city is to the westward.

Recognizing this direction of development, the Philadelphia Rapid Transit Company has built a four-track subway from the City Hall to the Schuylkill River under Market Street, from which point the road continues as an elevated structure out Market Street to the western city limits near Sixty-Third Street. The subway and elevated were built in response to the development in the western suburbs, and when completed will at once give added impetus to this natural trend of development.

THE METAMORPHOSIS OF AN ELECTRIC RAILWAY. THE VIEW AT THE LEFT SHOWS THE OLD TRACK OF THE PHILADELPHIA & WEST CHESTER STREET RAILWAY, WITH UNCERTAIN SURFACING AND ALIGNMENT, SCANTY BALLAST AND ABUNDANT WEEDS ON THE ROADBED. THE VIEW ON THE RIGHT SHOWS THE PRESENT ROCK-BALLASTED TRACK

This western trend of traffic is the key note of the enterprise in course of development by the Philadelphia & West Chester Traction Company, and it is the foundation upon which the large improvements are being made. The comple-

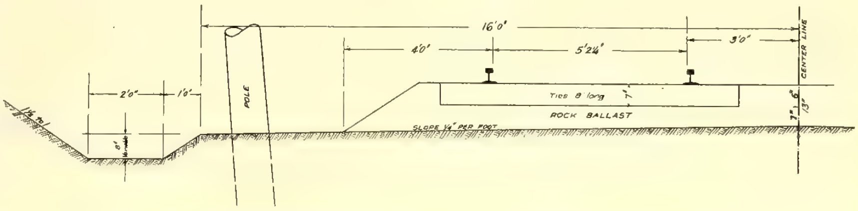
tion of the elevated will at once bring the western limits of the city 15 minutes nearer the City Hall, as the running time of the elevated trains will be 20 minutes or less, instead of 35 minutes for the present surface service. Moreover, the influence of well lighted, well heated trains, with large seating capacity, operated on fast and frequent schedule, immune from the necessary delays of surface travel in a congested city will be an important factor in increasing the western movement. The Philadelphia & West Chester Traction Company will take passengers at the Market Street terminal, and with the improvements made in all departments will distribute them comfortably, quickly and cheaply throughout a high, healthful and exceedingly beautiful suburban district hitherto undeveloped because of lack in transit facilities. The map on page 316 shows the territory served.

The territory served by lines operated by Philadelphia & West Chester Traction Company is in part very well built up; the main line taps the borough of West Chester, which has a population of 10,000 and also a large tributary population that is brought in touch by an electric line which extends in a northwesterly direction from West Chester to Downingtown and Coatesville, and which is now being connected up with the Lancaster County system; another electric line extends from West Chester to Kennett Square to the southwest, at which latter point connection is made with two other electric lines, one extending westward to Avondale and the other extending southward to Wilmington, Del.

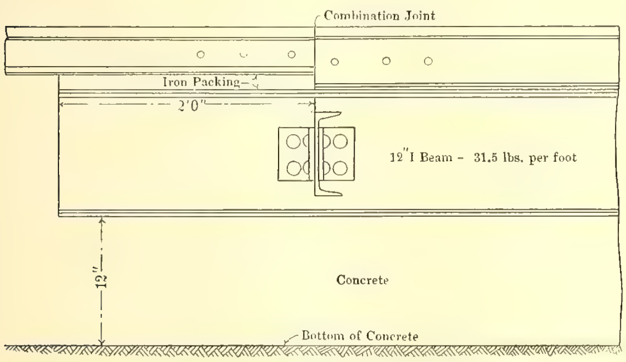
The Ardmore division taps a population of 7500 in Ardmore and passes through a growing territory. The Clifton division taps a population from Clifton and Aldan of between 3000 and 4000 and when completed on south to Collingdale (which extension is now under way), it will have a tributary population of over 5000; the Clifton division also intersects the railway running from Angora to Media at Clifton, and will also connect with the Philadelphia, Morton & Swarthmore line, control of which was recently acquired by the Philadelphia Rapid Transit Company, at Collingdale.

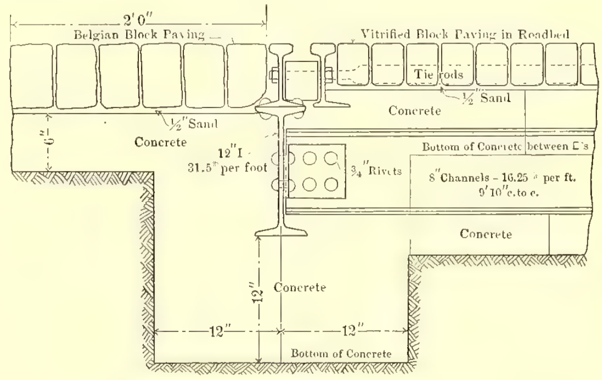
THE COMPANY'S POLICIES

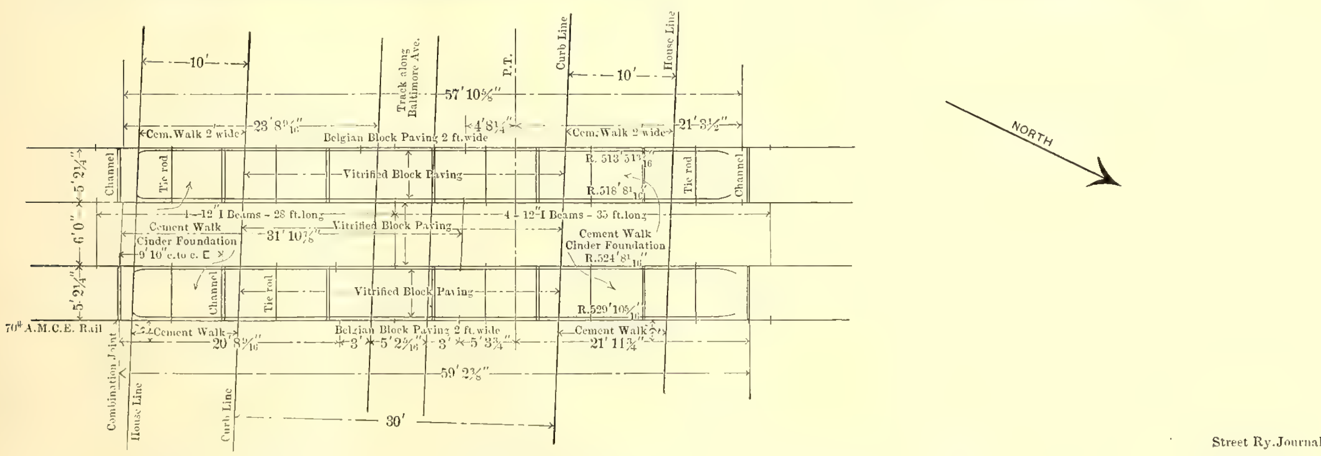
The investment necessary to carry out the improvements has been large, but the expenditures have already been justified by the returns. The company has built for the future, content for the present to take a moderate return upon the invested capital, and freely to invest new capital when the expenditure seems justified and prudent, in the expectation of reaping greater benefits and returns in the future development of its territory. This is exemplified by the fact that the management was satisfied with gross receipts of 22.4 cents per car-mile, $8,000 per mile of track, and $3.25 per car-hour, the returns for 1905. The receipts per mile of track are high, but the receipts per car-mile and per car-hour are low, because of the liberal service given. Cars are operated at certain times of the day with many empty seats, and a better showing could be made by curtailment in the present schedules, but the management adheres to the present frequent and fast service, confident in the belief that the "empty seat" question will work out its own solution, and the proportion of unoccupied seats to total carrying capacity, which may now seem extravagant, will gradually be reduced by the very fact



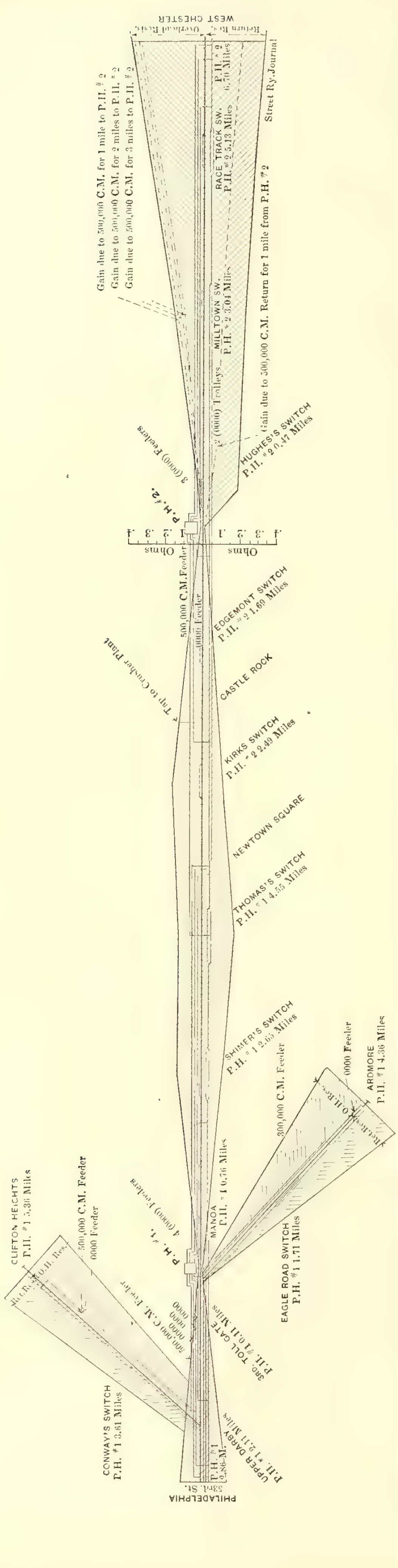
STANDARD SECTION OF DOUBLE-TRACK ROADBED







PLAN SHOWING THE METHOD OF CONSTRUCTION OF THE P. & G. STREET RAILWAY CROSSING AT BALTIMORE AVENUE, CLIFTON HEIGHTS, PA.



PLAN SHOWING FEED SYSTEM AND GRAPHIC ANALYSIS OF RESISTANCE ON TRANSMISSION LINES AND RETURN. ON THIS DIAGRAM DOTTED LINES WERE DRAWN TO INDICATE POSSIBLE ECONOMIES, AND FROM THEM IMPORTANT IMPROVEMENTS HAVE BEEN MADE EVIDENT

that the public is rapidly realizing that comfortable empty seats are available. In other words, the assurance of a comfortable seat in an attractive and substantially built car, run on a well-built and well-maintained roadbed at frequent intervals and on time, will create the travel necessary to fill the seats. Again, although the giving of a liberal schedule results in somewhat low return per car-mile and per car-hour receipts now, the policy of giving frequent service will produce infinitely better results in the future, because it is the all potent factor in developing the territory.

The company is working out another policy and one that is all too often neglected, namely, it is planning to develop a large winter traffic by giving in winter the same attention to frequency in schedules and inducements to travel as in summer. The management believes this matter of creating winter business deserves more attention than it usually receives. In summer, energetic efforts are directed towards inducing the public to ride for pleasure by providing cool, open cars, frequent service and various outdoor pleasure attractions. The management of the Philadelphia & West Chester has taken the position that the same energy, properly directed during the winter months, namely, in the providing of luxurious, well-heated cars, operated on a frequent and reliable schedule, and in advertising good restaurant facilities at terminal points, and the beauties of winter scenery, will induce the people to use the cars when in search of recreation and pleasure in winter as they do in summer, especially in winter when the opportunities for outdoor pleasures are limited. Thus the volume of winter travel will be more nearly equal to that of summer with the resulting advantages which accrue when traffic is well distributed throughout the year.

THE TRACK

The high standards followed in track construction are well shown on page 317. All rail installed in the past seven years is 70-lb. A. S. C. E. T. section. The ties are chestnut, 6 ins. x 8 ins. x 8 ft. laid on 2-ft. centers. The entire right of way on the main line and branches is graded and drained for double track. About 30 per cent of the total mileage is on private right of way, and the West Chester line is located along side of the West Chester turnpike, which is controlled by the Philadelphia & West Chester Traction Company.

The roadbed is rock ballasted throughout, with from 6 ins. to 8 ins. of stone under the ties. Provision is made for drainage by ditches at the side of the track and by iron or vitrified-pipe conduits at crossings and other points. All grade crossings are planked and are protected with crossing signs.

The track is bonded with 9-in. No. 0000 Mayer & Englund bonds. In a recent bond test of the road, made by Albert B. Herrick, the bonding was found to be in unusually good condition, the figure of merit for all sections averaging something better than 95 per cent, and in his report Mr. Herrick states that, exclusive of the switches on the inbound track from West Chester, this road is the best bonded interurban road he has tested in the last 8000 miles of test runs.

SPECIAL WORK

As showing the high-grade standard adopted for track work, and also as exemplifying the company's policy in building for the future, plans are reproduced on page 319, illustrating a crossing that is being installed at Baltimore Avenue, Clifton Heights, where an extension to the Clifton line crosses the tracks of another electric railway. The special work is of the Wharton manufacture with manganese centers, and is supported on a bridge formed of 12-in. I-beams, embedded in concrete. This construction makes an absolutely rigid and permanent crossing. The details are shown on the drawings.

CURRENT RETURN AND TRANSMISSION LOSSES

In order to analyze the effect on the current return system of the defective bonds and their relative importance in regard to the current return to power station, Mr. Herrick prepared the graphic illustration which is reproduced on page 320 for the double purpose of showing the exact condition on the road under consideration, and for illustrating the ingenious method by which the record is plotted graphically.

For instance, the record shows at a glance that west of power station No. 2 there is a large drop between the power station and Hughes switch, in fact, on the rail this drop is greater than all the rest of the bonding to West Chester. From the autographic record of bond tests it was found there were four defective bonds and one open bond in these rails, which affect the drop of the entire return current; the condition of the ground return, although exceptionally good, has since been still more improved by the replacement of the defective bonds.

BRIDGES AND VIADUCTS

In the work of eliminating grades and curves and improving the roadbed, a number of elaborate bridges and viaducts have been built. The more important of these are as follows:

There is one bridge of importance on the West Chester division. This bridge, which is situated at Ridley Creek, is 202 ft. x 2 ins. long, and is a four-span, single track, deck, plate-girder bridge, each span being 50 ft. long. Three spans of the bridge are built on a 5½-degree curve. The masonry of this bridge is constructed of stone, found in the immediate locality. The bridge seats are of concrete and are 18 ins. thick. Piers and abutments have been built for double track.

There are two bridges on the Clifton division—the Naylor's Run bridge and Darby Creek bridge.

Naylor's Run bridge is a double track, deck, steel-plate girder viaduct, 577 ft. 6 ins. long with sixteen spans, varying from 20 to 60 ft. in length. The viaduct is supported by six steel towers with an average height of 18 ft.

The footings of the steel towers rest on concrete pedestals capped with Port Deposit granite.

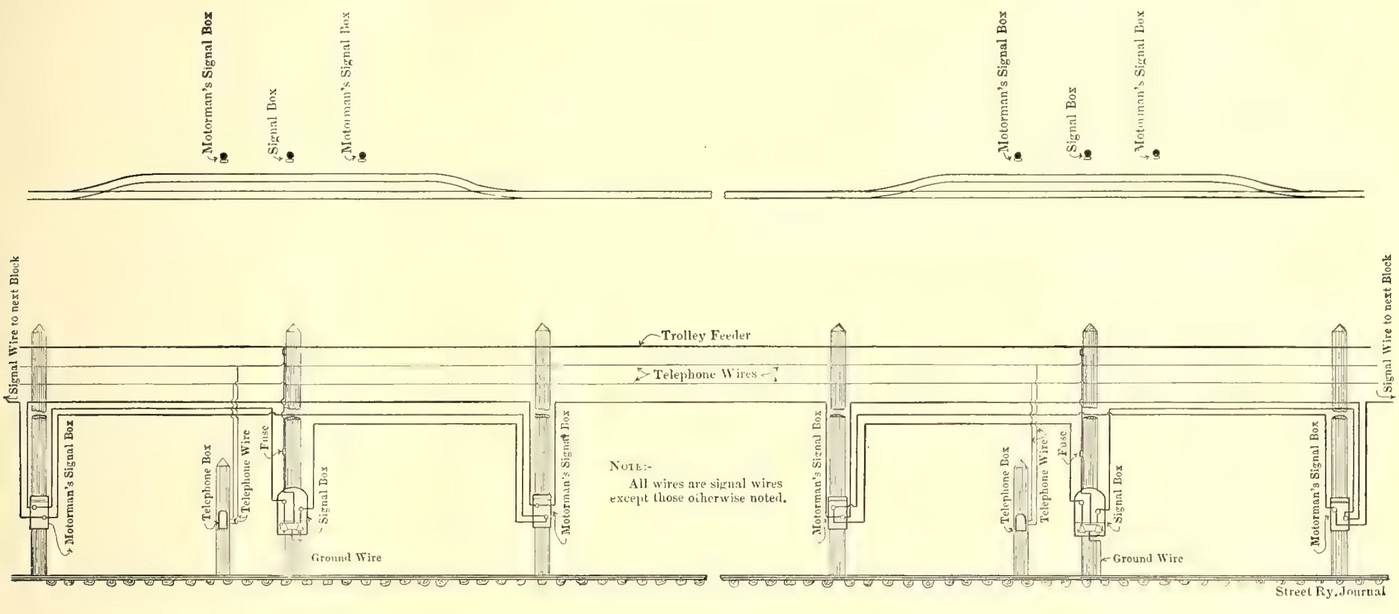
Darby Creek bridge is a double-track steel deck bridge 341 ft. 4½ ins. long, with a truss span 120 ft. long crossing a stream, and with plate girder approaches, the spans of which vary from 40 to 60 ft. in length.

All masonry used in the piers and abutments is first-class rubble and is lined with Hummelstown brown stone. All of these structures are capable of supporting cars weighing 50 tons, coupled together in trains of two or three cars and traveling at a speed of 50 miles per hour.

SIGNAL LIGHT SYSTEM

The signal light system is a modification of what is known as the Ramsey system. Briefly described, its principle is as follows: A westbound car, for example, running in block No. 2 is protected at turnout No. 1 by the signal lights burning in the east end of the signal light boxes, and at turnout No. 2 by the signal lights burning in the west end of the signal light boxes. Likewise, an eastbound car running in block No. 3 is protected at turnout No. 2 by the signal lights burning in the east end of the signal light boxes, and at turnout No. 3 by the lights burning in the west end of signal light boxes. Provided these two cars should pass at turnout No. 2, they simply trade blocks, the eastbound car being protected by the same signal lights that had been protecting the westbound car, and the westbound car being protected by the same signal lights that had been protecting the eastbound car. The accompanying plan shows the complete wiring for two blocks. Each turnout is provided with a set of three signal light boxes, consisting of one main box enclosing the signal lights and switches and two check-light boxes. The signal lights in the check-light boxes are wired in series with those in the main box and their purpose is to permit the motorman to check the operation of the lights by the conductor without having to leave his position at the front end of the car. The motorman is held equally responsible with the conductor for proper operation of this signal system. The check-light boxes are located on each side of the main box and at a distance of about one car length therefrom. The signal light switches are enclosed in the main box which is kept locked—all trainmen being provided with keys.

This system gives six lights, wired in series. This adds greatly to the life of the lamps, thereby eliminating most of the trouble usually experienced from lamps burning out when they are wired five in series. At the same time, due to an adequate trolley feeder system, which keeps the voltage fairly constant at all times, these lights burn brightly enough for signal light purposes.



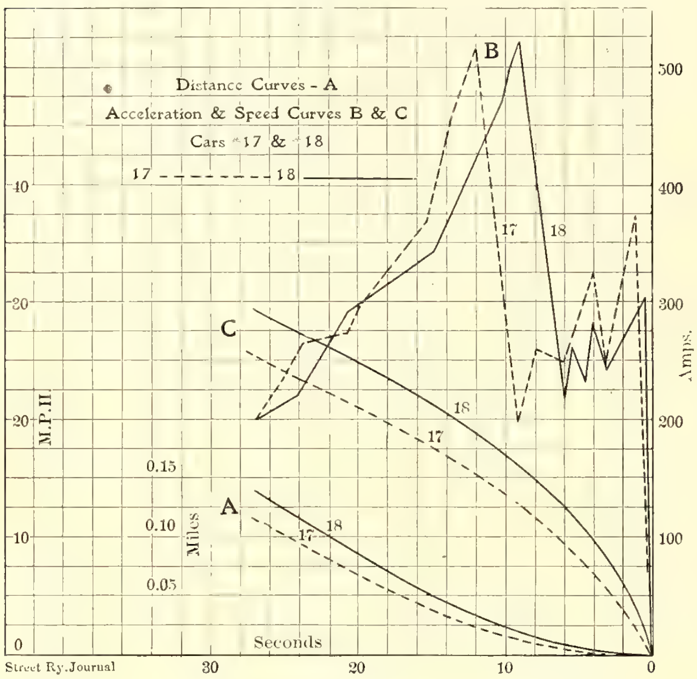
WIRING AND DETAILS OF SIGNAL SYSTEM FOR TWO BLOCKS

A telephone is provided at each turn-out—this telephone being connected to private telephone wires leading to the despatcher's office.

THE EFFECT OF GRADES ON COST OF OPERATION

The work of remodeling the roadbed with special reference to the elimination of curves and grades has been deliberate and along lines of securing certain definite economic results.

As outlining the conclusions upon which the work of eliminating grades has been carried out, and as containing data of value on this subject, a summary is here given of a report prepared by Albert B. Herrick, of New York, who has recently made careful tests and an exhaustive report on the subject.



SPEED-TIME CURVES FOR THE 44-FT. CARS

In the question of limiting or eliminating grades, the solution lies necessarily in the relation between the cost of construction and the decrease in the cost of operation, and it is to be remembered that if $20.00 can be spent in construction to save $1 in operating cost, the expenditure is earning interest at the rate of 5 per cent at the point where the expenditure is made and the economy effected. It is the summation or determination of all the economies that can be brought about by careful preliminary engineering considerations which fixes both the capitalization and earning values of any property. But the question of eliminating grades is a broader one than this, especially on certain critical lengths of road. For example, there may be taken a road between 17 and 20 miles long, on which is given an hourly schedule from each end of the line. Here, if heavy grades and sharp curves exist, two cars cannot make or maintain this schedule with safety, and three cars will be required, which will immediately increase the cost of operation from 18 to 28 per cent, due to the necessity of operating the third car to maintain the schedule, and yet the passenger revenue is no greater. The same is true with half-hour schedule. A greater number of stops will reduce the critical margin between two or three cars performing hourly service between terminal points.

In the matter of the effect of grades, assuming the case of a 1000-ft. grade of 3 per cent, as against a 5 per cent grade, and taking the cost of reducing the 5 per cent grade to a 3 per cent grade as $3,500, the relative value of the two can be computed as follows:

A car going up a 5 per cent grade for 1000 ft. has gained an elevation of 50 ft., and, assuming the car weighs 25 tons, the car's potential energy at the top of the grade has increased 2,500,000-ft. pounds. In order that the motors may produce this 72-hp of energy, there will be required at the power station, under the very best average conditions of conversion and transmission, the capacity to deliver 144 hp for the time that it takes the equipment to surmount this grade, assuming that the equipment is geared to 40 m. p. h. on the level, and a schedule speed of 20 m. p. h., including stops and slow-downs, is maintained. It would require 41 seconds to mount this grade, and during this time the station is exerting 144 hp for this one car, due to this grade alone.

Taking, on the other hand, the 3 per cent grade for the same distance (but as a matter of fact reducing grades reduces the distance between terminal points, as a grade may be considered a curve in a vertical plane) when the car has mounted this grade, it has gained potential energy of 1,500,000-ft. pounds, or 45 hp, and the station has had to produce only 90 hp for this car. The speed at which the car could ascend the 3 per cent grade would be 21 m. p. h., and the time consumed would be 30 seconds. The time gained on the 3 per cent grade compared with the 5 per cent grade would be 11 seconds, and the horse-power output at the station saved would be, by the lower grade, 54 hp for 30 seconds and 144 hp for 11 seconds each time a car mounted the grade. Assuming the cost of power at 1 cent per horse-power-hour, the cost of power would be .88 cents. Assuming the cost of time at $4.60 per car hour, this would mean a saving of .0137 cents, as representing the saving in car operation on the 3 per cent grade as against the 5 per cent grade. Assuming half-hour schedules at terminals and a symmetrical grade on each side, there would be a saving of $2.08 per day, or a return of 21.6 per cent on the $3,500 expenditure necessary to reduce the grade from 5 per cent to 3 per cent. This grade could be reduced still further with economy, but 3 per cent was taken as the limit because an ordinary equipment will float down a 3 per cent grade at the schedule speed, whereas, on a 5 per cent grade the brakes have to be applied to keep the car within speed limits; but in this consideration other capital expenditures are involved—for instance, the distance of the grade from the power house will have an influence on the amount of copper feeders required in order to maintain the proper potential delivery. If the heavier grade is the maximum grade on the route, it might be necessary to increase the capital outlay in the power station to meet this demand, and this is especially true if the meeting points are at the top of the grade and the maximum demand for both equipments occur at the same time. This would increase the station outlay at least $90.00 per horse-power, and it would also increase the station operating costs; moreover, most of the interest and maintenance on the additional power station equipment would be a standing loss, for this outfit would be required only for 41 seconds every 15 minutes.

The question involved in these cases is how much it is possible to reduce grades by forming an equation, one side of which is the cost involved in the reduction of the grade and the annual charge for this cost, the other side of the equation being the saving effected in power, time and maintenance. For each particular case the rate of interest for the cost of greater reduction can be equated against the operating expense in surmounting the proposed grade as against the reduced grade. The same argument applies with respect to avoiding curves. The saving in car mileage on a tangent track as compared with a track taking a sinuous course to reach the same terminals can be easily computed. In making the computation, regard should also be paid to the matter of slower schedules and increased accident hazard when operating on curves.

DESCRIPTION OF DIFFERENT TYPES OF EQUIPMENT

Type of Car	Seating Capacity	Length Over All	Trucks	Truck Centers	Wheel Base	Type of Wheels	Motors	Motor H. P.	Controllers	Brakes	Weight of Car Complete Empty	Maximum Speed at Zero Grade	H. P. per Ton
A closed..	40	40′ 1″	Brill 27-G	15′ 4″	4′ 0″	33″ rolled steel	4 West 68	160	K. 6	Air and hand	31,000 lbs.	25.0 M.H.P.	10.3
B closed..	40	41′ 0″	Brill 27-E	17′ 6″	6′ 0″	33″ rolled steel	4 West 68	160	K. 6	"	34,000 "	26.3 "	9.4
C closed..	40	41′ 0″	Brill 27-E	17′ 6″	6′ 0″	33″ rolled steel	4 West 68	160	K. 6	"	34,000 "	26.0 "	9.4
D17 closed	48	44′ 4″	Baldwin M. C. B.	25′ 6″	6′ 0″	34″ rolled steel	4 G. E. 73	300	Type M Automatic	"	68,000 "	29.5 "	8.8
D18 closed	48	44′ 4″	Baldwin M. C. B.	25′ 6″	6′ 0″	34″ rolled steel	4 G. E. 73	300	Type M Automatic	"	68,000 "	29.5 "	8.8
E open...	84	41′ 7½″	Brill 27-G	21′ 4″	4′ 0″	33″ cast	4 West 68	160	K. 6	"	27,000 "	25.5 "	11.8

As showing how practical application was made of these conclusions it was found, for instance, that by cutting down from a 5 per cent grade to a 3 per cent grade for a distance of 4700 ft. outbound, the allowable investment would be $10,-470. That is to say, the economy in car operation secured by cutting down the grade would be equivalent to 10 per cent on that amount. In the same way the allowable investment was determined for all of the grades on the line, and where the work can be done for the allowable investment, the grades are being reduced accordingly.

COST OF STOPS

The question of the cost of making stops has been thoroughly investigated, as this has an important bearing on the elimination of grades. The accompanying table prepared by Mr. Herrick gives the cost (in cents) of making stops on various grades with the different equipments. These costs were derived by first calculating the cost of a stop when running at a uniform speed of 20 miles per hour; then interpolating for the speed and time at the given grades from the speed-time curves. The report points out that the cost factor of a stop consists of two elements, the increase of time which adds to the platform expense and the increase in use of energy, due to the acceleration of the car.

Platform expense was taken as 40 cents per hour and the cost of power as 1.5 cents per kw-hour at the motors.

COST OF STOPS IN FRACTION OF A CENT ON VARIOUS GRADES

Platform time taken at 40 cents per hour and cost of power at the motor at 1.5 per kw h

Type of Car*	Grades in Per Cent							
	0	1	2	3	4	5	6	7
A......	.19	.21	.23	.25	.28	.31	.34	.42
B......	.18	.19	.21	.24	.25	.27	.30	.39
C......	.21	.22	.24	.25	.27	.30	.37	.45
D17....	.24	.25	.27	.29	.32	.36	.44	.59
D18....	.25	.26	.29	.31	.37	.39	.45	.57
E......	.13	.14	.15	.16	.17	.19	.22	.27

* See table describing each type.

ROLLING STOCK

In the selection of the later types of equipment, the management has had in mind two important considerations; first and foremost, the advertising feature secured by general appearance, finish and substantial design, and second, engineering considerations, based on efficiencies in grade climbing, power consumption and ability to serve the schedules. As to the first feature, a very decided policy has been formulated. Expressed in non-technical language, the idea has been to create a tendency on the part of the public along the line and in the terminal cities to ask, "Have you ridden in the new interurban cars of the Philadelphia & West Chester?" If this question becomes general, the management is content to take its chances on obtaining and retaining the business desired.

In designing the new cars now on order, engineering considerations have, to some extent, been subordinated to appearance and substantial construction. The argument in substantiation of this decision is: Assuming that the heavier car will cost 2½ or 3 cents more per car-mile to operate, this is equivalent only to the receipts from two additional passengers per trip and it is believed the traffic-drawing power of the more substantial and finer finished car, with the added assurance of ample seating capacity and safety, are sufficient to create far more than the additional business required to offset the slight increase in cost in operation.

The latest cars placed in operation on the road are built with solid steel underframing, upon which is laid corrugated galvanized iron supports for the floor, which is composed of layers of asbestolith with interlocking rubber tile laid thereon.

COST PER CAR MILE IN CENTS

Type of Car	Kw per Car Mile	Cost per Car Mile
A	2.7	4.05
B	2.9	4.35
C	3.8	5.70
D17	4.5	6.75
D18	4.2	6.30
E	2.6	3.90

FRICTION COEFFICIENT IN PER CENT OF DIFFERENT TYPES OF EQUIPMENT

Type of Car	West Chester Line				Ardmore Line				Clifton Line			
	Outbound		Inbound		Outbound		Inbound		Outbound		Inbound	
	Power Applied Per Cent of Time	Float Per Cent of Time	Power Applied Per Cent of Time	Float Per Cent of Time	Power Applied Per Cent of Time	Float Per Cent of Time	Power Applied Per Cent of Time	Float Per Cent of Time	Power Applied Per Cent of Time	Float Per Cent of Time	Power Applied Per Cent of Time	Float Per Cent of Time
A....................	62.8	37.2	75.4	24.6	69.0	31.0	68.0	32.0	75.0	25.0	65.2	34.8
B....................	58.7	41.3	62.8	37.2	73.8	26.2	60.2	39.8	67.8	32.2	54.4	45.6
C....................	64.7	35.3	55.6	44.4	70.8	29.2	52.2	47.8	70.0	30.0	65.0	35.0
D17..................	70.5	29.5	59.5	40.5	61.5	38.5	64.6	35.4	62.7	37.3	64.0	36.0
D18..................	56.0	44.0	66.0	34.0	65.0	35.0	55.2	44.8	66.0	34.0	70.5	29.5
E....................	68.0	32.0	50.7	49.3	65.3	34.7	51.6	48.4	70.5	29.5	51.3	48.7

CURRENT CONSUMPTION OF DIFFERENT TYPES OF EQUIPMENT FOR VARIOUS GRADES

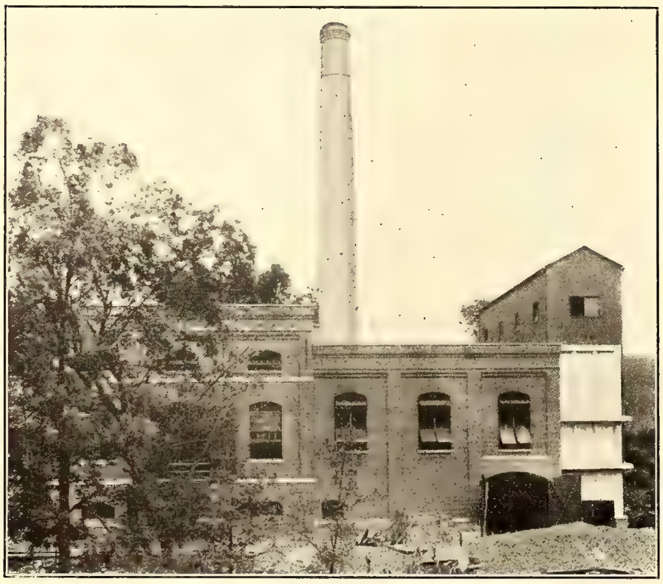
Car	0		1 Per Cent		2 Per Cent		3 Per Cent		4 Per Cent		5 Per Cent		6 Per Cent	
	Amp.	M. P. H.	Amp.	M. P. H.	Amp.	M. P. H.	Amp.	M. P. H.	Amp.	M. P. H.	Amp.	M. P. H.	Amp.	M. P. H.
A..........	110	25.	130	23.5	145	22.5	155	21.5	180	20.0	215	18.0	290	15.0
B..........	96	26.3	100	26.0	108	25.5	110	25.0	115	23.5	160	22.0	220	20.0
C..........	160	26.0	180	25.0	185	24.5	210	23.5	230	22.3	270	21.0	370	18.5
D17........	180	29.5	190	27.5	200	27.0	220	25.0	255	22.5	360	19.5	500	15.0
D18........	170	29.5	100	28.0	195	27.8	200	26.8	255	25.0	300	23.5	360	21.0
E..........	95	25.5	110	24.5	130	23.0	140	22.0	170	20.2	240	18.	320	15.5

The interior finish of the cars is very handsome in design and is secured by the use of vermilion wood. The seats are covered with leather; all windows are plate glass, and, as it is intended to run these cars in trains, the vestibules are arranged so that passengers may readily pass from one car to the other.

EFFICIENCIES OF CAR EQUIPMENT

To determine the relative efficiency of the various types of equipments, tests were carried out by Mr. Herrick on each type of rolling stock, for the purpose of securing autographic records of the current demand, voltage, delivery and speed-time curves, as well as for determining the efficiencies in climbing grades.

The friction coefficient was derived for each type of equipment in the following way: The total time required for the power to be applied to operate the car, and the time which the car floated without the application of power, were brought



POWER STATION NO. 2 AT RIDLEY CREEK, SHOWING REINFORCED CONCRETE COAL BUNKER ON THE RIGHT

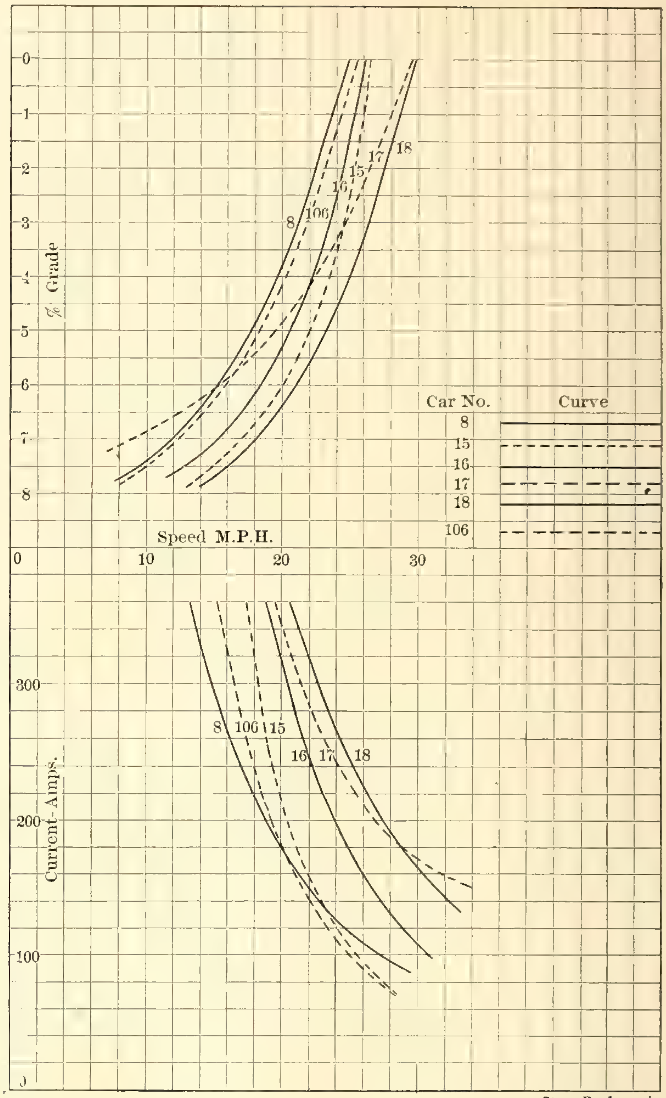


DIAGRAM SHOWING SPEED AND POWER REQUIRED ON DIFFERENT GRADES BY DIFFERENT EQUIPMENTS

TRANSPORTATION SHEET

DATE Thursday, July 5 1906.

West Chester Division, West Bound: Time	63rd St.	Eagle	Newtown Square	Penn Hotel	Milltown	West Chester Division, East Bound: Time	West Chester	Milltown	Penn Hotel	Newtown Square	Eagle	Ardmore Division, West Bound: Time	63rd St.	Ardmore Division, East Bound: Time	Ardmore	Clifton Division, West Bound: Time	63rd St.	Clifton Division, East Bound: Time	Clifton
A. M.						A. M. 5 15					1	A. M.		A. M. 5 27		A. M.		A. M.	
						5 45					6			5 42				5 23	
4 40			3	4	7	5 45	34	42	42	57	59	5 31		5 48	18	5 35	5	5 50	10
5 25						5 54				15	21	5 40	24	6 03	9	5 50		6 05	
5 10	1	1	3	4	5	6 15	30	34	30	35	38	5 55	31	6 18	14	6 05	19	6 20	28
5 30	27	24	21	25	30	6 45	22	30	31	37	49	6 10	47	6 33	14	6 20		6 35	
6 00	54	28	24	26	27	7 15	19	16	14	24	37	6 25	78	6 48	29	6 35	26	6 50	35
6 15						7 30						6 40	57	7 03	28	6 50		7 05	
6 30	44	21	15	16	16	7 45	18	18	19	29	37	6 55	36	7 18	25	7 05	19	7 20	17
645						8 00						7 10	48	7 33	28	7 20		7 35	
7 00	29	33	20	18	14	8 15	29	31	32	47	55	7 25	33	7 48	17	7 35	6	7 50	12
7 15						8 30						7 40	18	8 03	19	7 50		8 05	
7 30	24	17	11	15	17	8 45	24	17	20	30	35	7 55	25	8 18	26	8 05	9	8 20	13
7 45						9 00						8 10	18	8 33	12	8 20		8 35	
8 00	15	14	11	13	13	9 15	34	34	35	47	48	8 25	14	8 48	15	8 35	10	8 50	14
8 15						9 30						8 40	20	9 03	19	8 50		9 05	
8 30	26	20	12	8	8	9 45	26	26	28	34	37	8 55	16	9 18	23	9 05	6	9 20	17
8 45						10 00						9 10	14	9 33	26	9 20		9 35	
9 00	27	28	24	26	26	10 15	34	32	32	37	37	9 25	21	9 48	34	9 35	15	9 50	18
9 15						10 30						9 40	14	10 03	15	9 50		10 05	

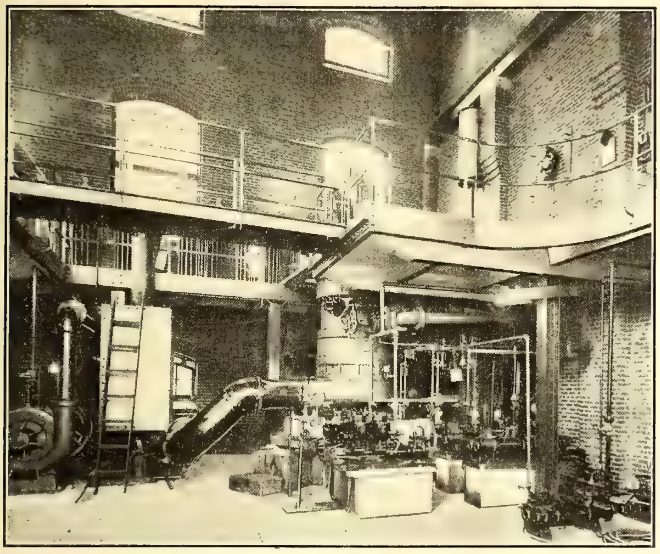
PART OF TRANSPORTATION SHEET FOR THURSDAY, JULY 5

to a percentage basis, and the length of time which the car floated was taken as a criterion of all friction elements which tend to stop the car. The higher the percentages of floating, the less will be the friction involved in the operation of the equipment.

The accompanying curves give the grade climbing efficien-

cies, current consumption and speed-time curves for the different classes of equipment.

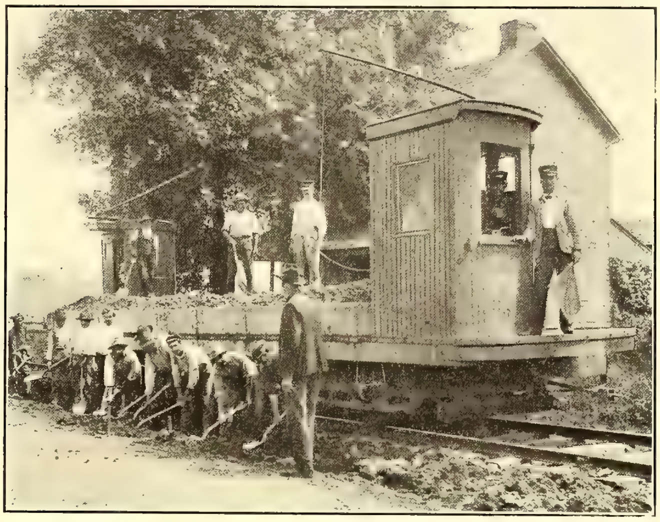
As showing the use to which data of this kind can be put, it will be observed that the efficiency of car type D18 is better on grades than car type D17, but on the level they run about the same. This indicates that the brakes do not release well, and also indicates a continuous friction which consumes energy that should be more usefully applied to the operation of the equipment.



ONE OF THE 500-KW, D. C. TURBO-GENERATORS IN POWER STATION NO. 2

SCHEDULES AND FARES

At present a half-hour schedule is given on the West Chester line between West Chester and Sixty-Third Street. A 15-minute schedule is given on the Ardmore line from Sixty-Third Street to Ardmore. A 15-minute schedule is given on the Clifton line from Sixty-Third Street to Collindale. The service is given with single-car units. As soon as the elevated trains are placed in operation it is proposed to give these same schedules, but it is believed that at certain hours of the day, at least, it will be necessary to run two and three-car trains on the schedules, and the new cars are equipped with multiple unit control for this purpose. The rates of fare are: Twenty-five cents between Sixty-Third Street and West Chester, a distance of 20 miles; 5 cents between Sixty-Third Street and Ardmore, a distance of 2 miles, and 5 cents between Sixty-Third Street and Clifton, a distance of 3.2 miles.

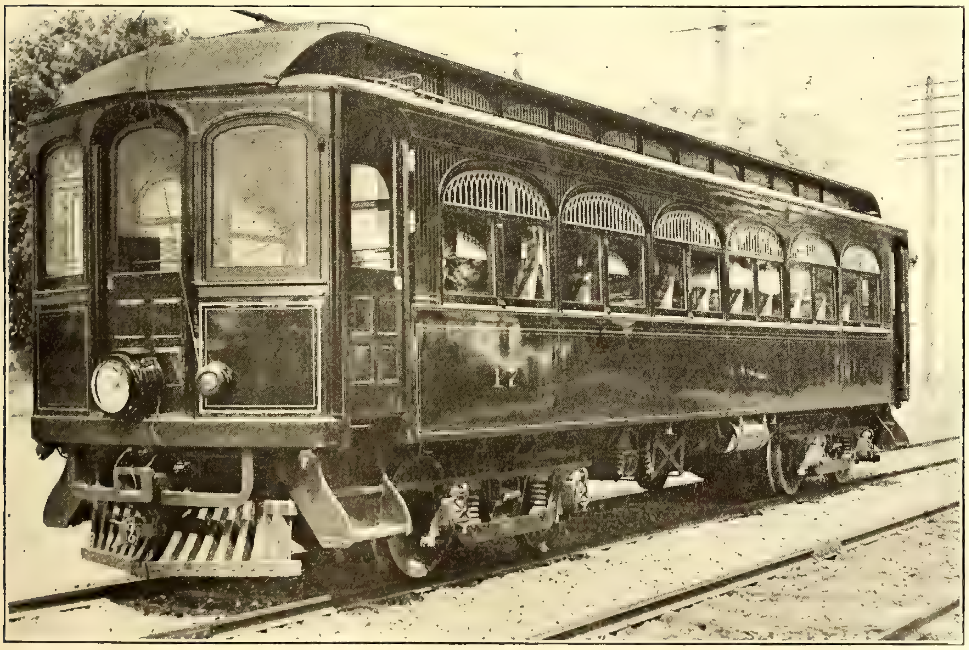


CONSTRUCTION CAR, PHILADELPHIA & WEST CHESTER TRACTION COMPANY

The fares are based on the zone system, and a separate 5-cent fare is collected from each passenger at each zone.

For watching the efficiency of the schedules, the record, shown on the opposite page, is kept. On this is entered the number of passengers carried on each trip, in each fare zone, and as the seating capacity of the cars is known, it becomes a simple matter to determine if the cars are properly serving the travel at each hour of the day. In this sheet the number of passengers is entered in red, if the car carried at the given point more passengers than could be seated.

This record is watched carefully every day, and if the red figures appear in any way too frequently for any trip, a larger type of car is immediately substituted on that trip, as it is the intention of the management, as pointed out before, to advertise this service by the assurance, in so far as possible, that seats will be available for all passengers at all hours.



STANDARD INTERURBAN CAR WITH STEEL UNDERFRAME OF THE PHILADELPHIA & WEST CHESTER TRACTION COMPANY

POWER STATIONS

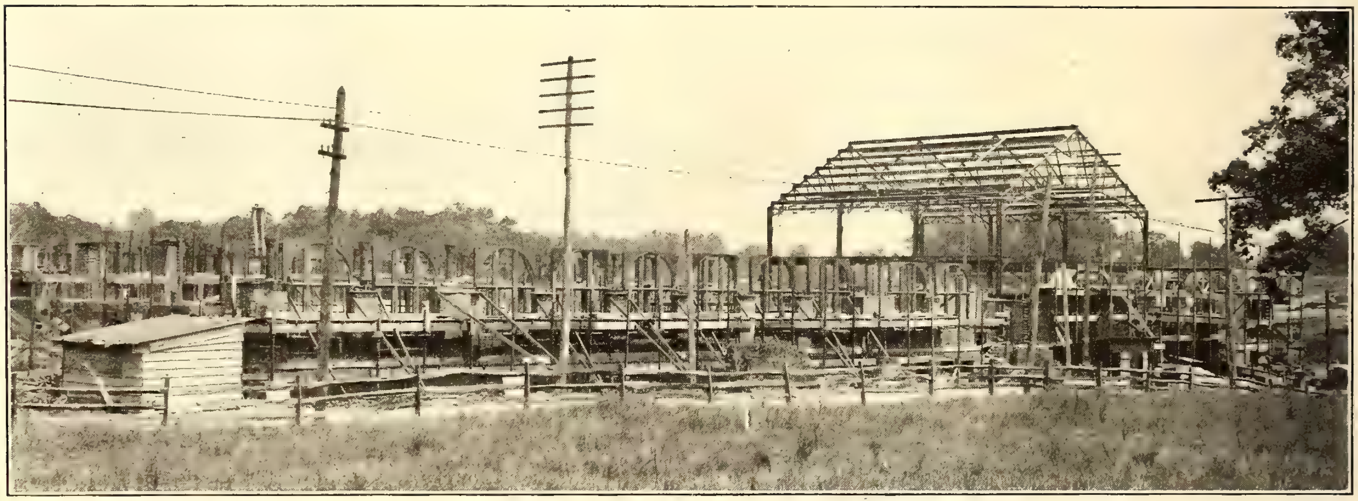
The original power station was located at Llanerch, not far from the eastern terminal. The entire apparatus in this station has been replaced, and the plant, which is known as Station No. 1, now contains the following: Two 400-kw Westinghouse double-current generators, direct connected to two 650-hp Hamilton Corliss engines. Each of these machines will deliver either 575-volt direct current or 350-volt alternating current, or each can be arranged to deliver both kinds of current simultaneously. Up to this year the western section of the line was served from a rotary sub-station located at Ridley Creek, taking alternating current from the

double-current machines at Station No. 1. This current was stepped up to 10,000 volts at the generating station, and was transmitted at this voltage over a high-tension line located along the line of the railway.

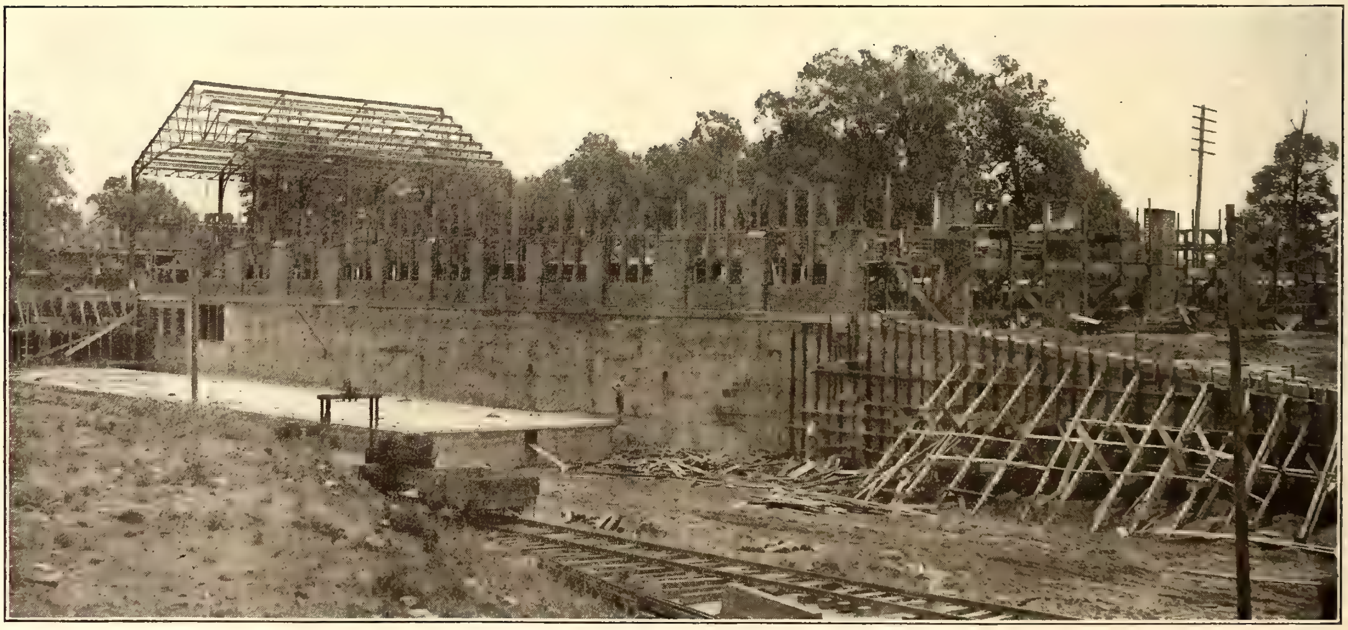
INTERIOR OF A STANDARD CAR OF THE PHILADELPHIA & WEST CHESTER TRACTION COMPANY

It is interesting to note that this high-tension line never gave satisfaction, owing to the great number of trees along the route, and short circuits were constantly occurring, due to the contact with trees, or caused by falling twigs or branches. For this reason the management became convinced that it was impossible to operate a high-tension line where trees overhang the line in great numbers, owing to the interruption to schedules due to short circuits.

Accordingly, an entirely new power scheme was laid out. This included the erection at Ridley Creek of a new direct-current station, now known as Station No. 2. The generating apparatus at this plant consists of two 500-kw Curtis steam turbines, direct connected to General Electric direct-current generators. This station supplies current to the line from West Chester east to Newtown Square, and Station No. 1 supplies current from Newtown Square east to the Sixty-Third Street terminal, and also to the Clinton and Ardmore branches. The two stations are tied together, and the current from both equalizes on the line, the dividing point fluctuating, according to the load, about a mile each way. The feeders from the two stations are joined at the dividing line

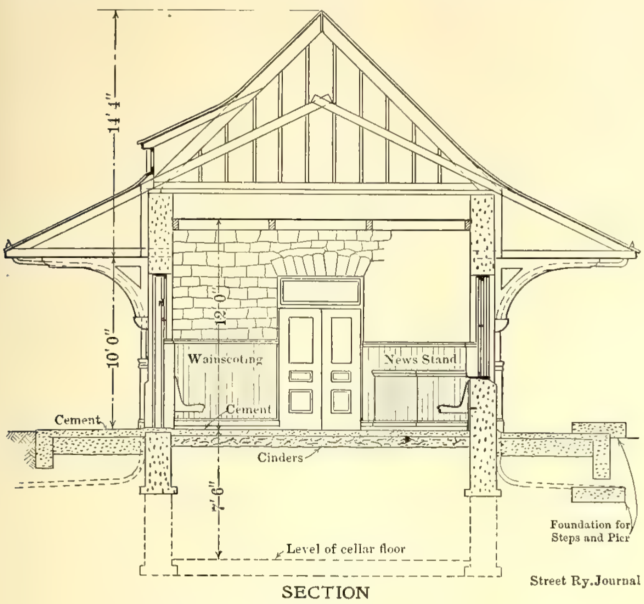


SOUTHERN ELEVATION OF TERMINAL BUILDINGS. THE PORTION OCCUPIED BY THE PHILADELPHIA & WEST CHESTER RAILWAY EXTENDS FROM THE HIGH STEEL STRUCTURE WESTWARD



NORTH ELEVATION OF EASTERN TERMINAL, SHOWING LOADING PLATFORMS OF MARKET STREET ELEVATED

by a disconnected switch, which provides for cutting the line into two sections if desirable. The original high-tension line and the sub-station apparatus at Ridley Creek are held



SECTION OF A WAY STATION

in readiness to be used in case of breakdown in the direct-current units.

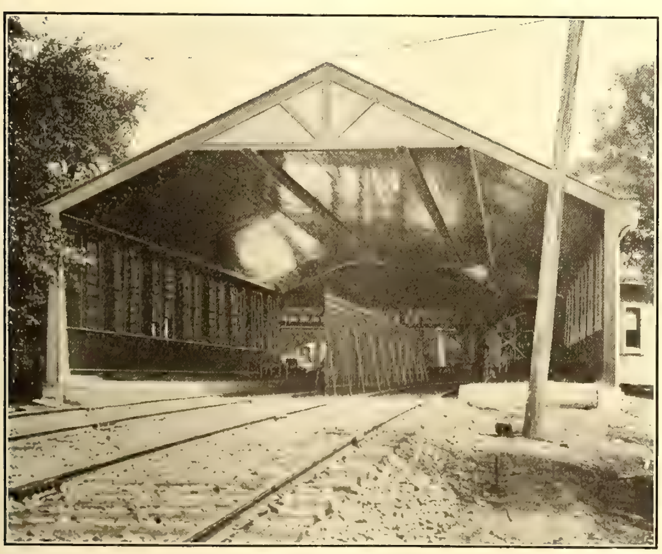
At the Llanerch power house there are three 450-hp Edge

DATA OF POWER STATIONS

	Total Rated Capacity of Engines in hp.	Total Rated Capacity of Generators in kw	Total Rated Capacity of Boilers in hp.	Rated Output Capacity in kw	Maximum Output Capacity in kw.	Rated Capacity in kw per Mile of Track Served
Sta No. 1, Llanerch ..	1,300	800	1,350	800	1,200	40.2
Sta. No. 2, Ridley Creek	1,340	1,000	900	1,000	1,500	75.2

Cost of current at switchboard, excluding interest on depreciation, .09c.

Moor boilers. At the Ridley Creek power house there are two 450-hp Edge Moor boilers.

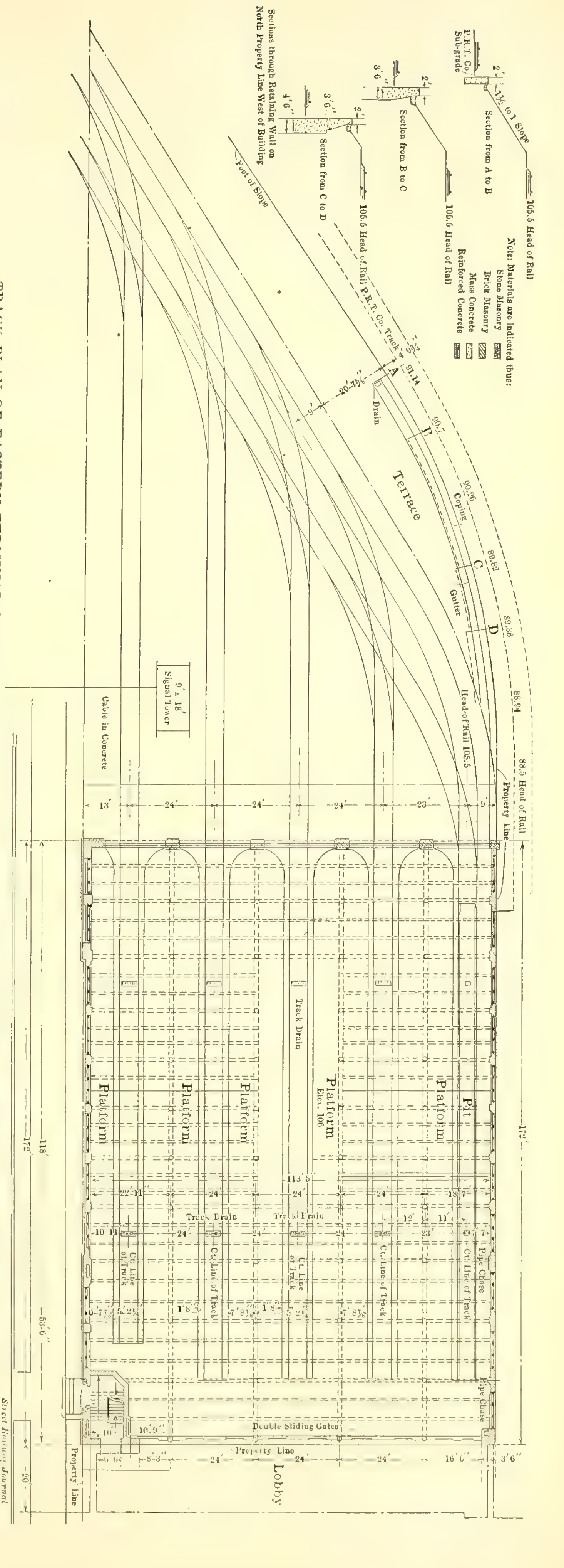


LOOKING INTO TRAIN SHED, ARDMORE TERMINAL STATION

The table above gives certain interesting data concerning the two stations.

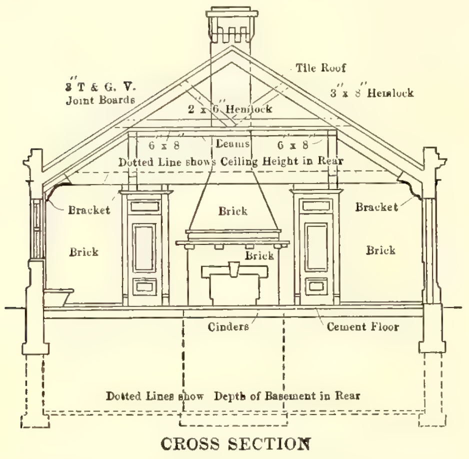
CONDENSING WATER AT STATION NO. 2

One of the interesting features at Station No. 2 is the arrangement for securing condensing water supply.

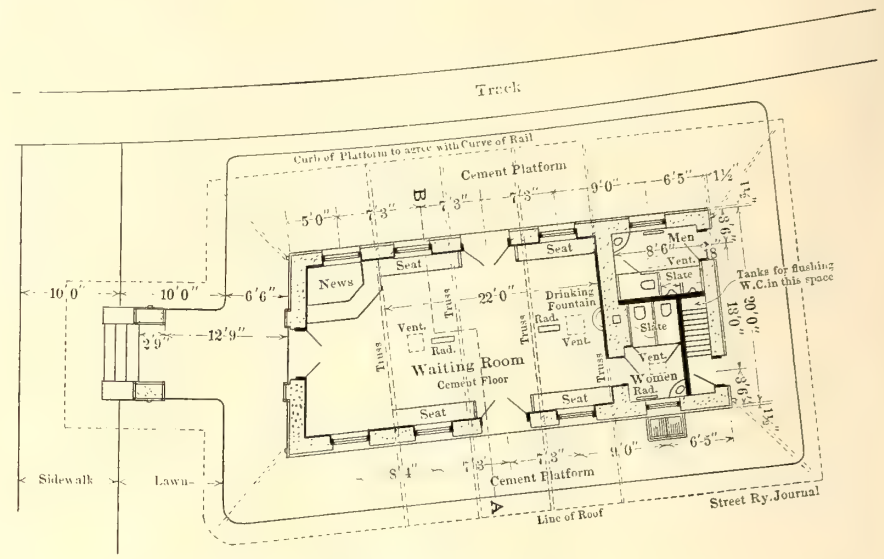


TRACK PLAN OF EASTERN TERMINAL STATION OF THE PHILADELPHIA & WEST CHESTER TRACTION COMPANY

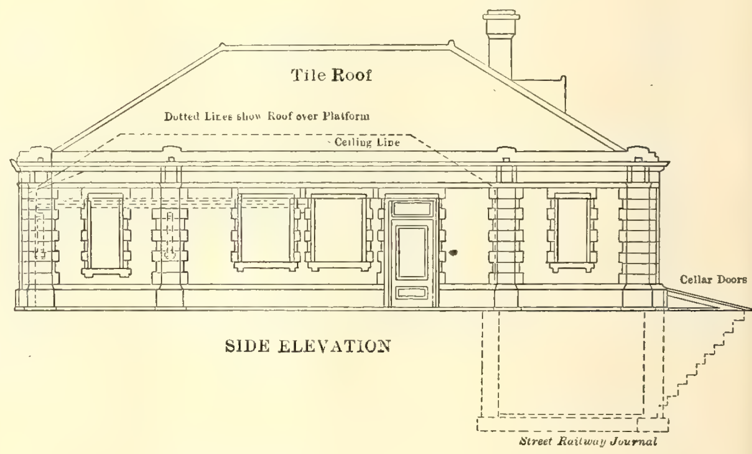
This power house is located along the bank of Ridley Creek. The water used in the power house is taken from a concrete dam located about 1000 ft. up stream, and is led through an open race to an open concrete reservoir in front of the power house. The water used for the boilers is pumped from the reservoir through feed water heaters into boilers by two duplex steam pumps of the Worthington type. The water for the condensers is also taken from this reservoir by means of two condenser pumps. One of these is a centrifugal pump direct connected to a 35-hp, 550-volt Westinghouse motor; the other is a Bulkley steam pump, 12 ins. x 20 ins. x 24 ins.



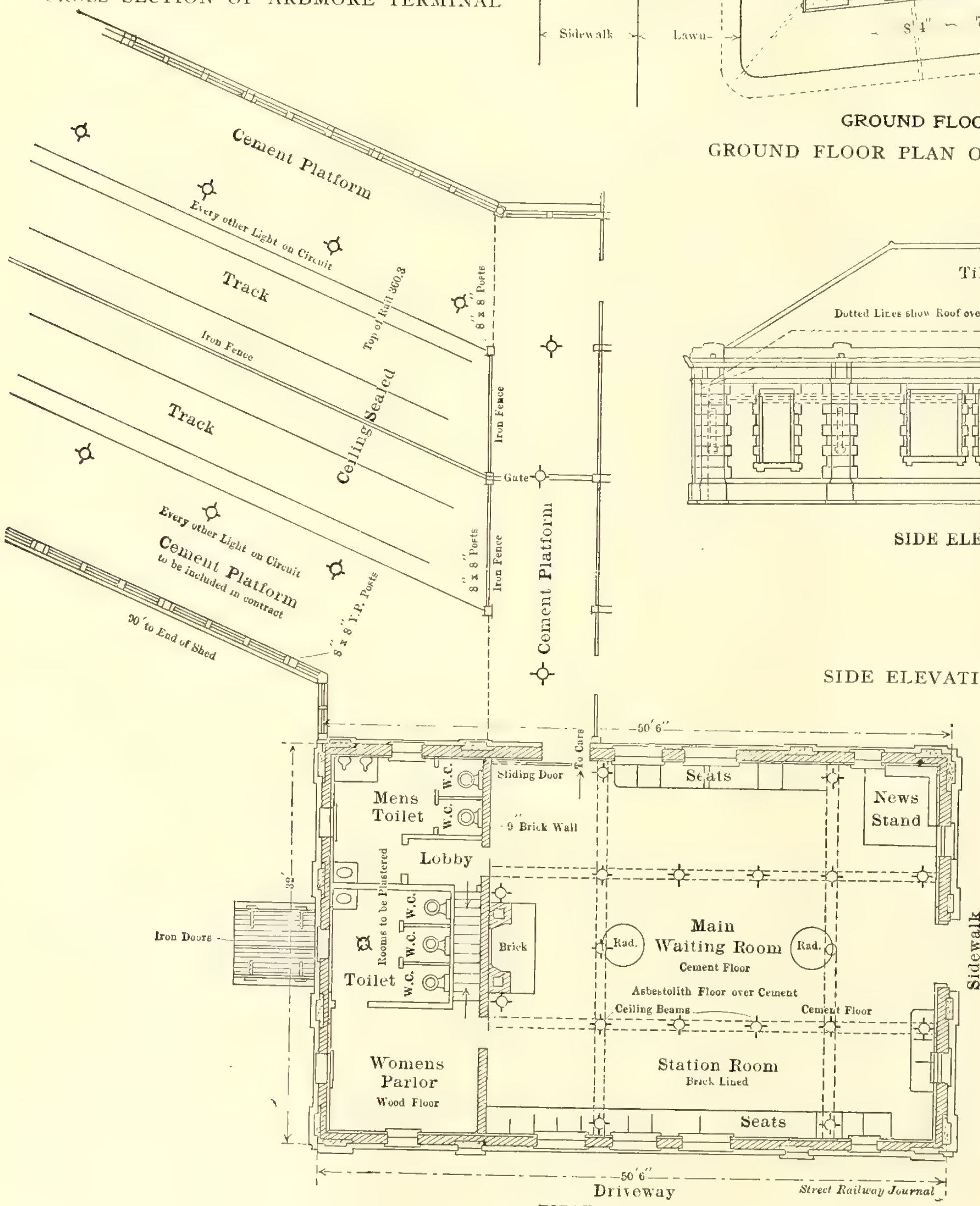
CROSS SECTION OF ARDMORE TERMINAL



GROUND FLOOR PLAN OF TYPICAL WAY STATION



SIDE ELEVATION OF ARDMORE TERMINAL



FIRST FLOOR PLAN OF ARDMORE TERMINAL AND TRACK APPROACH

The piping is so arranged that either pump can supply water to either or both of the condensers. The overflow pipe from the hot-well leads back into the creek, and it is also provided with tee and gate valves, so that, if desired, part or all of the water from the hot-well can be made to flow into the reservoir. This is done in cold weather to prevent the water from freezing in the reservoir.

CONCRETE COAL BUNKER

Another interesting feature at Station No. 2 is the concrete coal bunker. Coal is taken from the steam railroad tracks by means of a siding, and is dumped into the coal bins situated in front of the boiler room. The coal bins at Llanerch

are of wooden structure with steel-lined bottoms, and have a capacity of approximately 1,000,000 lbs. The coal for Ridley Creek power house is hauled from the coal bins at Llanerch by means of work cars, and is emptied into the coal bins at Ridley Creek by means of a siding leading over the same. The bins at Ridley Creek are of concrete construction and have a capacity of 1,000,000 lbs. of coal. The chutes from these coal bins are located in the boiler room directly in front of the boilers.

The coal at Station No. 1 is received and stored in a steel-lined bunker.

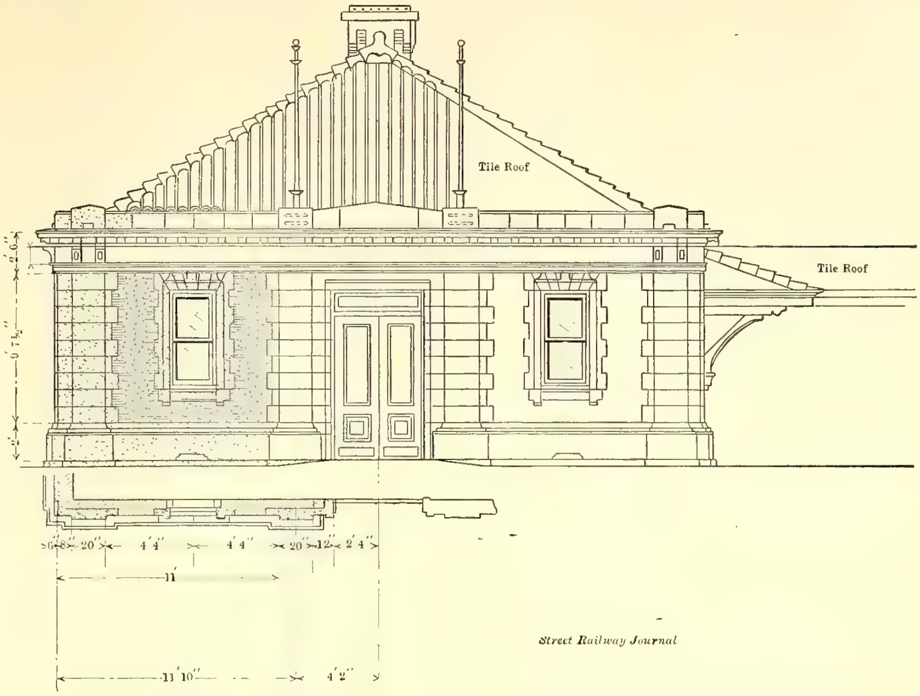
CRUSHING STONE

As the company has need for large quantities of crushed stone for its turnpike work, and also for ballast, it has secured a stone quarry about 9 miles from the West Chester terminal, where a complete stone-crushing plant has been erected.

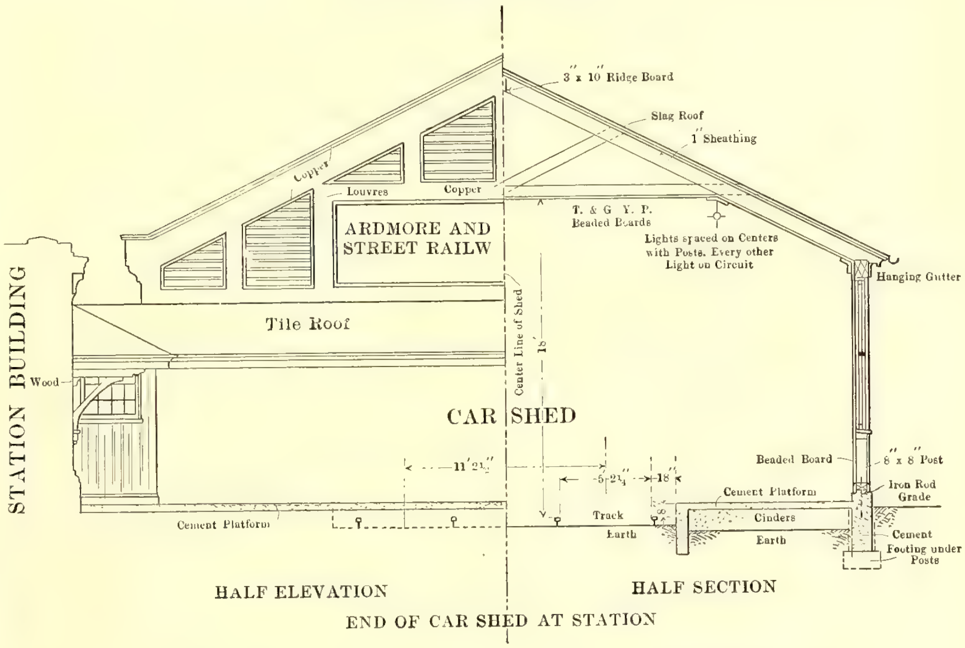
The plant is operated by 550-volt direct-current railway motors, and comprises one 36-in. x 18-in. B. Farrell crusher and one 24-in. x 13-in. B. Farrell crusher, both having manganese steel jaw plates. The apparatus also includes one 18-in. steel bucket belt elevator, 45-in. centers, complete with belt, buckets, etc., and driven by a pair of miter gears. The screen, which is 45 in. in diameter x 16 ft. long, is made of 1/4-in. hard steel plates with 2-in. holes, and includes a dust jacket of 1/4-in. steel plate, with 3/4-in. holes, which is attached to the first section of the screen.

The apparatus is arranged in an elevator type of building, as shown in the illustration. The stone is carried from the quarry directly into the top of the crusher over a trestle. The stone then falls through the crusher and screen, and passes out through a chute in the bottom of the building, directly into the construction cars. The plant is capable of producing 300 tons of broken stone, between the size of 3/4 in. and 1 1/2 ins. in ten hours.

Apropos of the economy effected by an electric railway company in maintaining its own quarry and crushing plant, the management of the Philadelphia & West Chester Traction Company is satisfied that if a



ARDMORE TERMINAL STATION BUILDING. FRONT ELEVATION AND HALF PLAN OF FRONT WALL

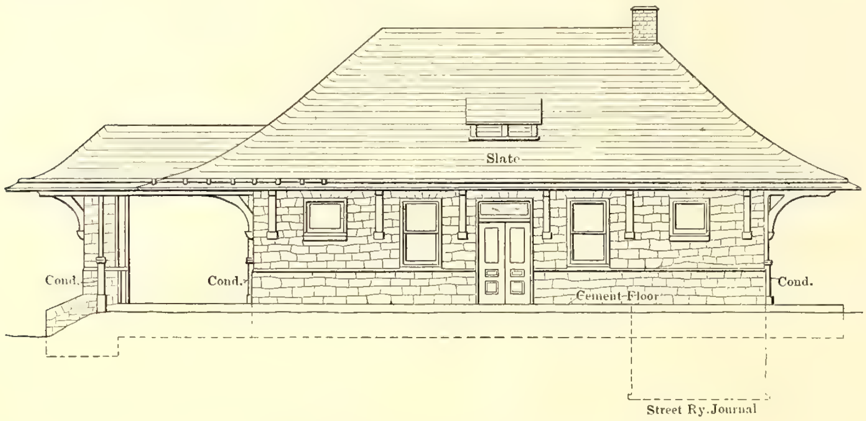


HALF ELEVATION AND HALF SECTION OF ARDMORE TERMINAL

THE ARDMORE TERMINAL

company requires crushed stone in large amounts, there will be a saving in building its own crushers if it can obtain a suitable quarry conveniently located.

The management has kept careful records relative to this matter, and the following statistics are submitted as showing the saving achieved by having its own plant. These records will be of interest to any interurban road that may be confronted with this problem.



REAR ELEVATION OF A TYPICAL WAY STATION

COMPARATIVE COSTS OF CRUSHING AND BUYING BALLAST

Average Cost of Crushing Stone at Castle Rock for Months of March, April and May, '06

3,730 yds. stone quarried and delivered at crusher at $1.20	$4,476.00
708 " " " " " " " " 1.00	708.00
Labor for running crusher	437.40
Power—29,560 kw-hours, at $0.01	295.60
Grease and oil	134 54
Repairs to crusher (including swing jaws and toggles)	196.80
Total cost for crushing 4,438 yds. ballast	$6,238.34
Cost of crushing ballast per yard	1.405
Cost of buying ballast per yd., delivered in stone bins at Llanerch	1.93

WAY STATIONS

The company is erecting attractive and substantial way stations at all important points along its line. The typical layout of these stations is shown on pages 328 to 330. The structures are built of stone with slate roofs, and are ornamental in design.

THE ARDMORE TERMINAL

Ardmore is an aristocratic residential suburb, and the company, in line with its policy of catering to the requirements of its patrons, has erected a suitable terminal station at this point. The station is immediately opposite the Pennsylvania Railroad station.

The terminal building, as will be seen from the illustrations, consists of the passenger station proper and an adjoining car shed, from which the cars leave. The station building is an attractive, substantial structure, built of pressed brick with tile roofing, and embellished with ornamental architectural designs. The attractiveness of the interior is increased by an open fire-place. Entrance to the car shed from the station building is through a sliding door. This is used for controlling the movement of passengers. There are two stub tracks in the car shed, with concrete platforms at either side and an ornamental iron fence between the tracks. At the ends of these platforms are exit gates, and the practice is to have the cars come to the platforms and there discharge passengers through the exit gates. The door to the station building is then opened for outbound passengers, who board the cars without conflicting with the discharging passengers.

THE MARKET STREET TERMINAL

As stated, there is now being erected at the Market Street terminal of the elevated road, near Sixty-Third Street, an elaborate terminal building, which will be used jointly by the Philadelphia Rapid Transit Company, the Philadelphia & West Chester Traction Company, and the Philadelphia & Western Railroad Company. The building at this writing is approximately half finished, and will be described in these columns in a later issue. The important features of the design, with particular reference to the section that will be occupied by the Philadelphia & West Chester Traction Company, are shown on the views on pages 326 and 327. In this section there are five terminal tracks with broad cement platforms between each track. Each platform is divided for its entire length into two sections by means of an ornamental iron fence, one side of each platform in each case being for unloading passengers and the other for loading passengers. At the ends of the platforms are ornamental gates, and passengers will leave and enter the unloading and loading platforms in about the same manner as is now usually done at all large steam railroad terminals. From the train shed of the Philadelphia & West Chester Traction Company passengers will walk through a waiting room, and will then descend by steps to the tracks of the elevated road, which are on a lower level. The entrance tracks to the train shed are shown on the drawing, and all movements of trains will be controlled by an elaborate system of interlocking switches and signals installed by the United Switch & Signal Company. The movements will be made from a signal tower erected in the yards just outside the train shed.

TYPICAL WAY STATION ON THE CLIFTON DIVISION BEFORE LANDSCAPE WORK OR APPROACHES HAD BEEN DONE

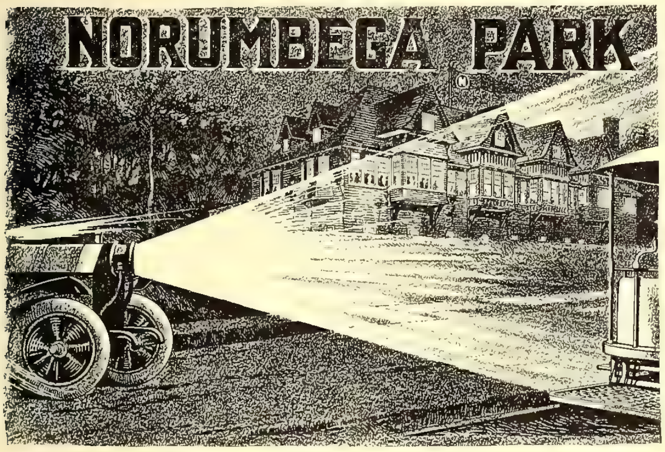
The bottom has dropped out of the roadbed of the Toledo & Chicago Interurban Railroad between Auburn, Ind., and Garrett. At that point the tracks cross an old peat bed, and on Aug. 15 the track began to sink, and subsequently sank out of sight. From soundings made, 38 ft. of water covers the roadbed and tracks. Passenger and express traffic is now being transferred at Auburn. Engineers are devising plans to bridge the chasm until it can be filled in. Other railway companies experience similar troubles in Northern Indiana.

STREET RAILWAY ADVERTISING

BY GEORGE SABIN BRUSH

The subject of advertising to increase the business of street railways is receiving much more attention then ever before, and almost every road of any size now has an advertising department, which devotes its entire time and energy to preparing and issuing advertising matter, aiming to call to the attention of prospective patrons the attractive features of the various roads, and thereby increasing its patronage.

The Norumbega Park Company, situated at Auburndale-on-the-Charles, in Massachusetts, this year has gone into the



THE FRONT OF THE AUTOMOBILE BOOKLET

matter of advertising in a far more comprehensive manner than ever before. Each week a program of the attractions at the theater is printed in large type on a dasher 14½ ins. x 21 ins. Two of these posters are placed on each end of each and every car on the systems of the surrounding towns, also on 100 cars operating in Boston and running to a terminal where cars may be taken directly for the park. This method of advertising attractions has proven very satisfactory, and has unquestionably materially increased the patronage at the park. We find that the patrons of the park watch these posters very carefully to get an idea of the weekly attractions at the park.

We have placed in all cars which run to or near the park two notices on a stiff cardboard 11 ins. x 21 ins. advertising the resort and giving the admission price, hour of performance and hour of opening park, etc. These notices also state that round-trip tickets, including admission to the grounds, are sold by conductors on the cars for 15 cents. We feel that these cards unquestionably keep before the public the fact that the park is in operation, thus increasing our patronage.

We have placed in the territory through which the park draws its patronage, in drug and other stores, a frame which takes a regular 14½-in. x 21-in. poster. These posters are renewed each week, and, in compensation for the same, we give two tickets for admission to the park and two reserved-seat tickets in the theater, to the proprietor of the store. In two towns (South Framingham and Natick) we have placed a special poster advertising the park, same size as those above referred to, stating that passengers can go from these two points for 35 cents and 25 cents, respectively, including admission and return.

For Lexington Park, situated on the line of the Lexington & Boston Street Railway, in Lexington, we have issued similar advertising matter, except that for all advertisements for the latter we use red as the standard color, while for Norumbega Park we use blue. We run special cars from Woburn, Concord and Maynard to the park certain days of the week.

In the cars of the Lexington & Boston Road cards are placed similar to those in the cars running to Norumbega Park, advertising the 15-cent, round-trip tickets, etc. These are printed in the standard red color.

The Lexington & Boston Street Railway runs through the historic villages of Lexington, Concord, Bedford and Arlington, and, especially to advertise this particular feature, we have placed in windows throughout the territory affected a neat card 28 ins. x 9 ins., at the left-hand end of which is a cut 7½ ins. x 8½ ins. The cut is a drawing of Paul Revere on his horse riding through the streets at night to warn the villagers of the approach of the British soldiers. The remainder of the card is occupied with large printing advertising the Concord, Lexington and Lowell route as the Paul Revere Scenic Short Line. In addition to placing these cards in store windows, they are mounted in a special frame across the center of the cars against the hood lining in the monitor. In compensation for the privilege of placing these cards in store windows, we give to the manager of the store a six-coupon ticket good on any car of the Lexington & Boston Road.

A REPRODUCTION OF THE SPLENDID PAUL REVERE POSTER—A CLEVER APPEAL TO THE PATRIOTIC ELEMENT

At the time of the well-known "Marathon" race, which is held in the territory west of Boston each year, under the auspices of the Boston Athletic Association, we ran special cars which followed the runners from the beginning to the end of the race. This we believe to be an extremely good move, as our returns proved it.

The foregoing description covers the large poster adver-

tising with the exception of one, three, and twenty-four-sheet posters, which are put on bill-boards throughout the territory affected, and also a large lithograph 36 ins. x 24 ins. for windows wherever allowed.

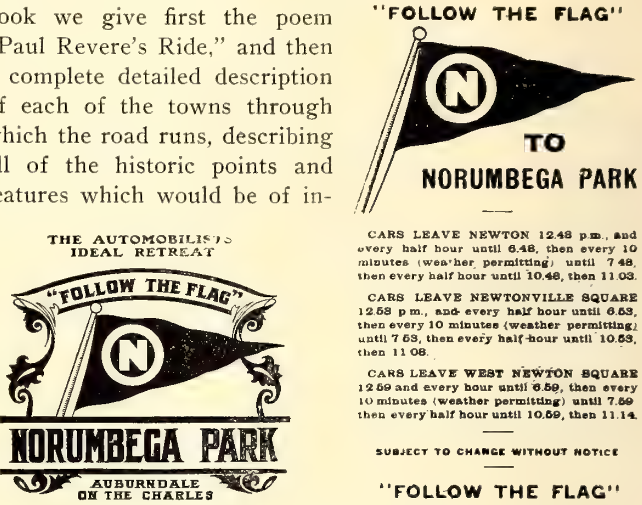
In addition to this, we get out a small card 6 ins. x 3 ins., printed in white on a blue background, advertising the restaurant at Norumbega Park. We also get out for Norumbega Park a small two-page folder 3½ ins. x 6 ins., on which we print the attractive features of the park, giving a cut of the steel theater on the back page, and a cut of a canoe on the Charles River on the front page, the inside of folder being devoted to a list of attractions and a cut of restaurant. Another small folder is published similar to the above. It is 3½ ins. x 6 ins. in size. The front page carries a cut of the theater, and the rear page, a cut of the grounds, the inside of the folder being devoted to a description of the attractions. A small card, 2¼ ins. x 4 ins., was also prepared, on both sides of which we publish a time table and the routes of all cars going to and from the park, this being meant for a small vest-pocket edition.

We believe that each and every road should have an attractive and significant trade-mark, and, therefore, have designed a trade-mark for all roads and parks under our control in the form of a wheel with eight spokes, each spoke having printed on it the name of a road or park, and the flange showing the name of the principal road and the home office. In the background is shown a cut of an electric car.

In addition to all of the above advertising, we have published three distinct booklets, one having an edition of 50,000 copies, entitled "Country Rides by Trolley, Boston and Vicinity." In this book we give a very extensive description of each of the twenty-two towns through which we operate; advertising matter in regard to our properties, including the parks and railways; a detailed time table showing leaving time, road, fare and running time, on the entire system from any given point to any other point, and sixteen views of various attractive features to be seen on our system. The large center page is devoted to a map of the entire system, with a list of the particular points of attraction. This book contains sixty pages and cover, and is printed on 70-lb. paper with the best printing in a neat and attractive manner. The size of the book is 4¾ ins. x 6 ins. It acts as a guide for trolley riders throughout the entire territory for some 25 miles west of Boston. This book we distribute free in stores or residences throughout the entire territory affected, and advertisements are also inserted in the papers stating that it will be sent upon the receipt of a 2-cent stamp.

TWO CHARACTERISTIC CIRCULARS

We have published on the Lexington & Boston Street Railway for a great many years a folder of about forty-eight pages entitled "The Route of the Minute Men." This has become quite a famous publication, and is known by all those who have ever visited the towns of Lexington, Concord, Bedford and Arlington. We publish 25,000 copies of this every year, and have continual requests for it from all over the United States. In this book we give first the poem "Paul Revere's Ride," and then a complete detailed description of each of the towns through which the road runs, describing all of the historic points and features which would be of interest to tourists. There are also twenty-six cuts of houses, monuments and other spots which are of particular historic interest. The article in regard to the "Route of the Minute Men" was written by a very able writer of New England, and no advertising matter is allowed to creep into the folder. There is also a map of the Lexington & Boston Street Railway, showing the route of the "Minute Men" and principal points of interest on the route, while the front cover shows the statue of Capt. John Parker, commander of the minute men at the battle of Lexington.



EXPLOITING THE "FOLLOW THE FLAG" EMBLEM

In order to promote the business at Norumbega Park derived from automobilists, a special booklet 6 ins. x 4 ins. was gotten out, on the front page of which is an automobile, the headlight of which illuminates the restaurant. Within the booklet we give five cuts of various attractive features of the park, tell how to reach the park by automobile from Boston; advise our patrons of the means we have for caring for automobiles at the garage, and give a description of the attractive features of the park, the theater, and a description of the restaurant, calling to the attention of our patrons the fact that it is first class in every respect, and that tables and meals can be ordered in advance by telephone. These books are distributed extensively among the garages of Boston and vicinity, and are also sent to owners of automobiles.

We feel that anything which can be done to keep before the eyes of our patrons the fact that we have an attractive park and an attractive railroad system results to our benefit. We have even gone so far as to publish a song entitled "Out to Norumbega Park," on the front page of which is a large cut of the stage of the park steel theater. These songs we sell for less than cost in order to get them into the hands of our patrons.

We also issue a four-colored map 16 ins. x 20 ins., showing our entire system and connecting lines. On the back of this map we have descriptions of Lexington, Concord, Lowell, Lexington Park and Norumbega Park, with three-colored pictures of the different towns and parks. On the trolley poles of all cars going to Norumbega Park we place a blue

flag, on which the letter "N" is stamped in white, signifying that car is bound for Norumbega Park. On the trolley poles of all cars going to Lexington Park we place a red flag, on which the letter "L" is stamped in white, signifying that that car is bound for Lexington Park.

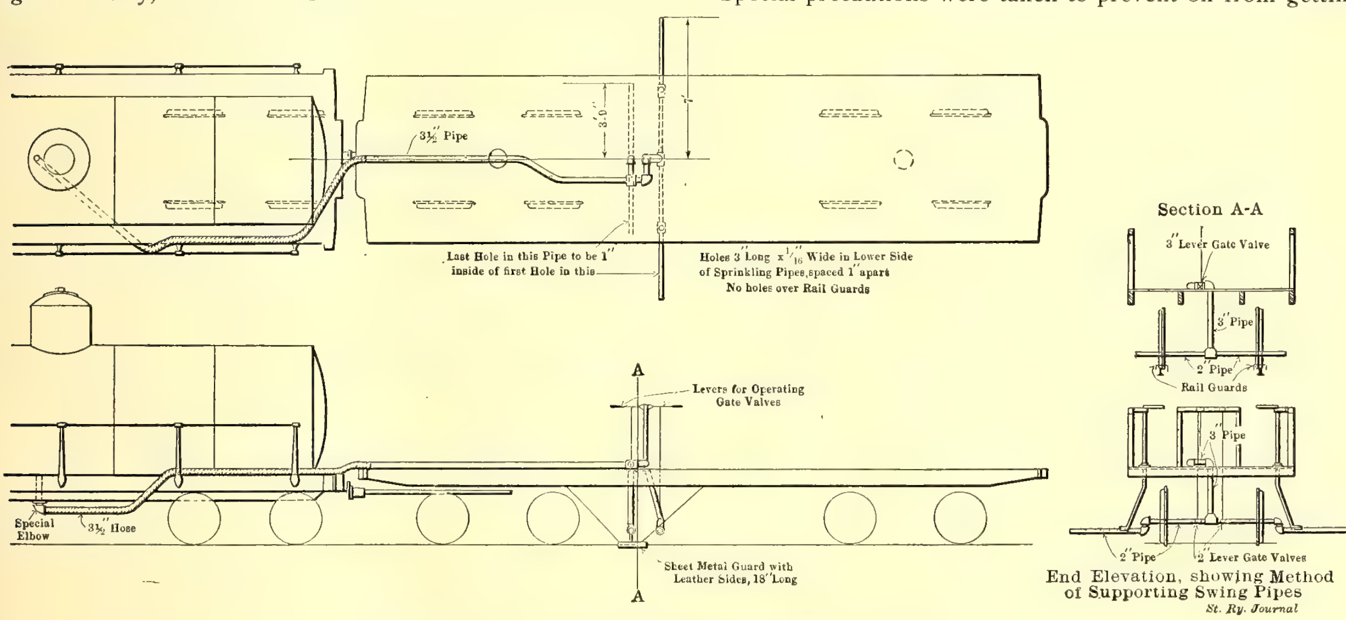
With all our printed advertising, however, we believe that the best advertising in the world is what we term "live advertising," meaning by that a satisfied patron. We do not believe it does any good to advertise a park or a street railway unless you give your patrons their money's worth, and give them exactly what you advertise. Any patrons leaving the park satisfied with the results of their trip will do more good than all the booklets which you can possibly issue.

We therefore make a good effort to see that each and every patron riding with us is thoroughly satisfied, and do all in our power to make their visit pleasant.

OILING OF ROADBEDS ON THE BROOKLYN RAPID TRANSIT SYSTEM

For the purpose of preventing dust on its suburban surface lines, the Brooklyn Rapid Transit Company has recently sprinkled a considerable proportion of its track with crude oil. A number of suburban lines, former steam-operated roads, are operated by this company over private rights of way, and in the summer season are devoted to a motor flat-car of the company's rolling stock, which served both to haul the tank cars in which the oil was received, and also to carry the sprinkler piping by which the oil was delivered to the roadbed. The latter consists of horizontal sections of 2-in. piping which has long, narrow holes on the underside and is hung transversely in two sections from the bottom of the flat cars. These sprinkling sections were supplied from the tank car by a length of 3½-in. hose, which was carried from the outlet opening underneath the tank car up and along the side of the tank car to the delivery piping on the motor flat car, the flexibility of the hose permitting of passing curves without trouble. The two sections of sprinkler pipe are each valved for independent operation. One section is so located as to sprinkle only to a distance of 3 ft. 9 ins. on either side of the center of the track, while the other covers the outer portions of the roadbed from these points to points 7 ft. distant from the center of the track on either side. The latter sprinkler sections overhang some 3 ft. upon either side of the car, are mounted upon swiveling connections and are fitted with handles so as to permit of being swung out of the way of obstruction at the side when necessary. Both sections of sprinkler pipe are operated by 3-in. lever gate valve, the handles of which are conveniently mounted by a framework above the middle of the car platform.

Special precautions were taken to prevent oil from getting



ARRANGEMENT OF OIL SPRINKLER ON SURFACE FLAT CAR

the heavy excursion traffic between New York and the ocean resorts. About 16 miles of these lines, all double-track, have been sprinkled, making in all about 32 miles of single track covered.

For this purpose, a low grade of crude petroleum was used costing about 3 cents per gallon, and about 2000 gals. were used per mile of track, or 4000 gals. per mile of double track. The oil was received in standard railroad tank cars from the Gulf Refining Company, New York, and these cars were utilized as the distributing reservoirs from which the oil was drawn in sprinkling. This oil is one of the very lowest grades, as it has been found that a heavy oil, undesirable for refining purposes, is most suitable for sprinkling on roadbeds, for the reason that such an oil has a large amount of asphalt products, which make refining very difficult, but have an important value as a cementing agency in binding the sand and dust of the roadbed.

The sprinkling equipment was very easily improvised from onto the running rails, which would result in seriously delaying train movements. For this purpose, rail guards are provided. These guards consist of metal shields with the ends slightly rounded up, and to the sides of which are attached pieces of leather which hang somewhat below the head of the rail on either side. These shields were strongly braced from the under-framing of the car to prevent injury to the sprinkler pipe in case of meeting possible obstruction.

The results of the sprinkling process have been very satisfactory, as the oil cements the dust and sand into a semi-solid mass from which practically no dust is generated by trains passing at high speed. The dust nuisance had proved particularly troublesome on these lines of the company prior to oiling, owing to the large proportion of sand in the soil of the roadbed. The result of the oiling upon the mechanical equipment of trains has been highly beneficial, since considerable less dust has been found to accumulate upon the motors of trains operating over these divisions.

THE NEW OHIO VALLEY ELECTRIC RAILWAY PROPERTIES

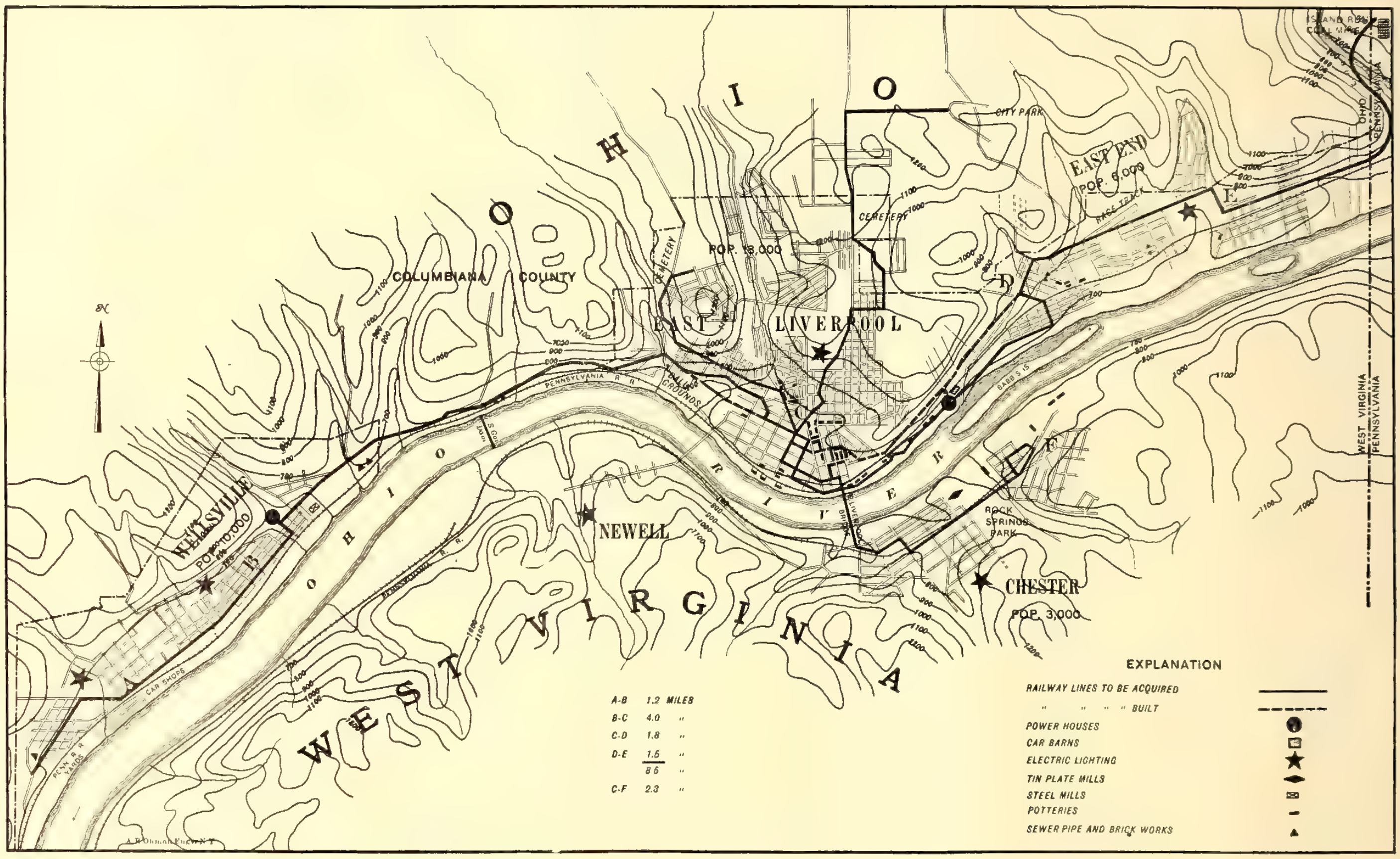
Nature has been kind to the Ohio Valley and particularly so to the section between Pittsburg, Pa., and Wheeling, W. Va. The Ohio River (which here forms the boundary line between West Virginia and Ohio) has hollowed out for itself a deep bed through the heart of an extensive highland bluff, so that the valley proper, comprising the river bed and a strip of rich bottom land on either side, from the river to the bluffs, presents a natural and comparatively narrow thoroughfare through a range of interlocking hills. Because the latter are full of coal, of clay, of natural gas and of oil, the valley through this section has become one practically continuous stretch of industrial plants, wherein is produced a large part of the steel, tin plate, pottery, fire brick, paving brick, tile and the vitrified sewer pipe of America. Because the hills are high on either side and the bottom lands narrow, the villages and towns wherein live the two hundred thousand or so of people, dependent upon the manufacturing plants, have been strung out like beads. In the vernacular of the locality these are "shoe string towns."' For instance, there is virtually an unbroken succession of densely populated streets located on the strip of bottom land, on the Ohio side of the river, from the easterly city line of East Liverpool to the southerly city line of Wellsville, a distance of 12 miles. This is but typical of the other populous towns in the valley. This strip in no place is over half a mile in width and at many points only one or two hundred yards wide. Even a casual consideration of these conditions reveals the urgent necessity for transportation facilities such as can be given only by an electric railway.

This valley lives in the present tense—the clouds of smoke from a thousand mills and potteries leave no room for a shadow of doubt as to that—albeit the stretch of the valley from Beaver, Pa., on the north, to the enterprising city of Steubenville, Ohio, on the south, a distance of nearly 50 miles, never has had adequate interconnecting electric railway facilities. This one past-tense condition is about to be rectified by the Ohio Valley Finance Company, of which W. Caryl Ely is the president and guiding spirit.

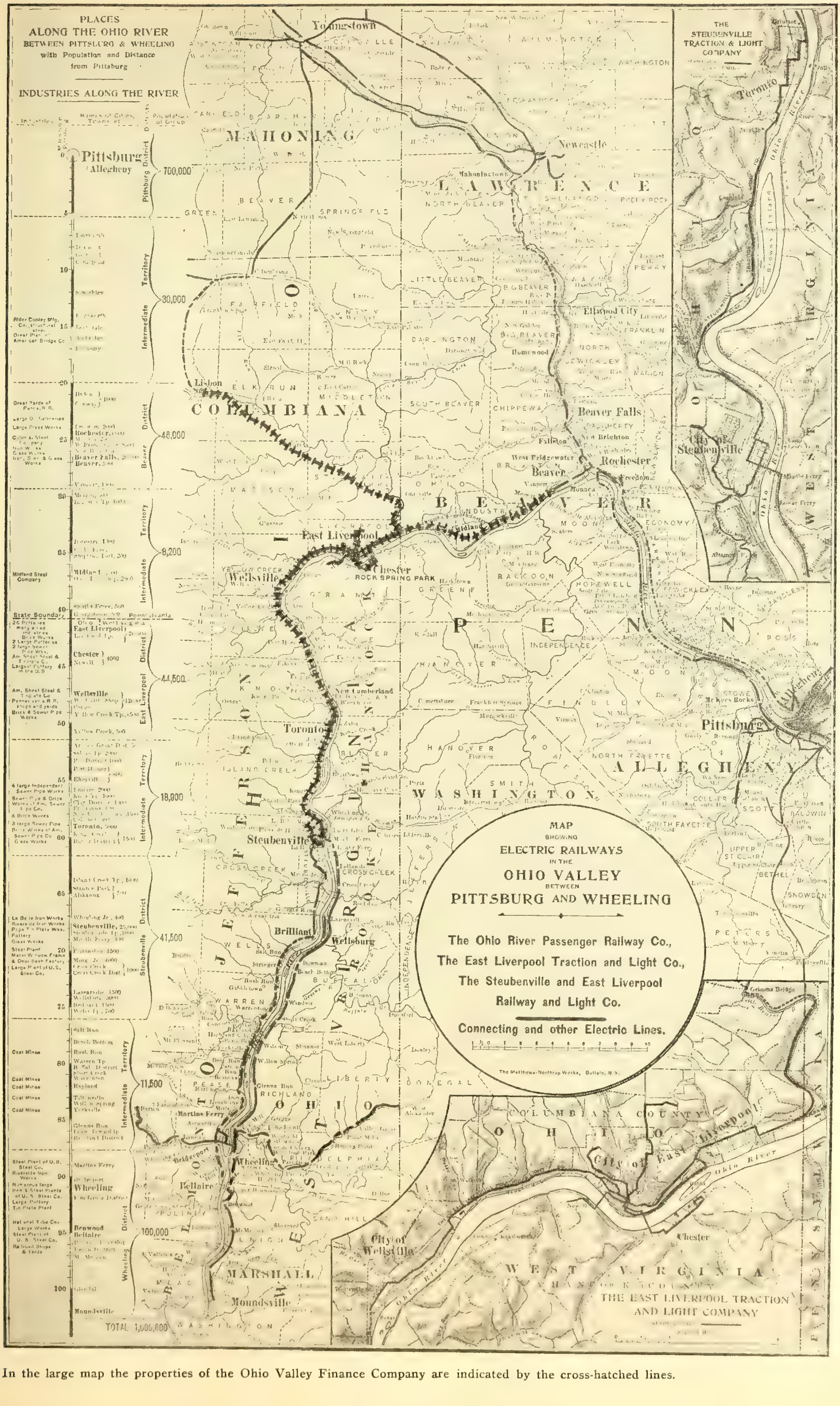
SUMMARY OF ROUTE

The following is a brief summary of the route (see accompanying maps):

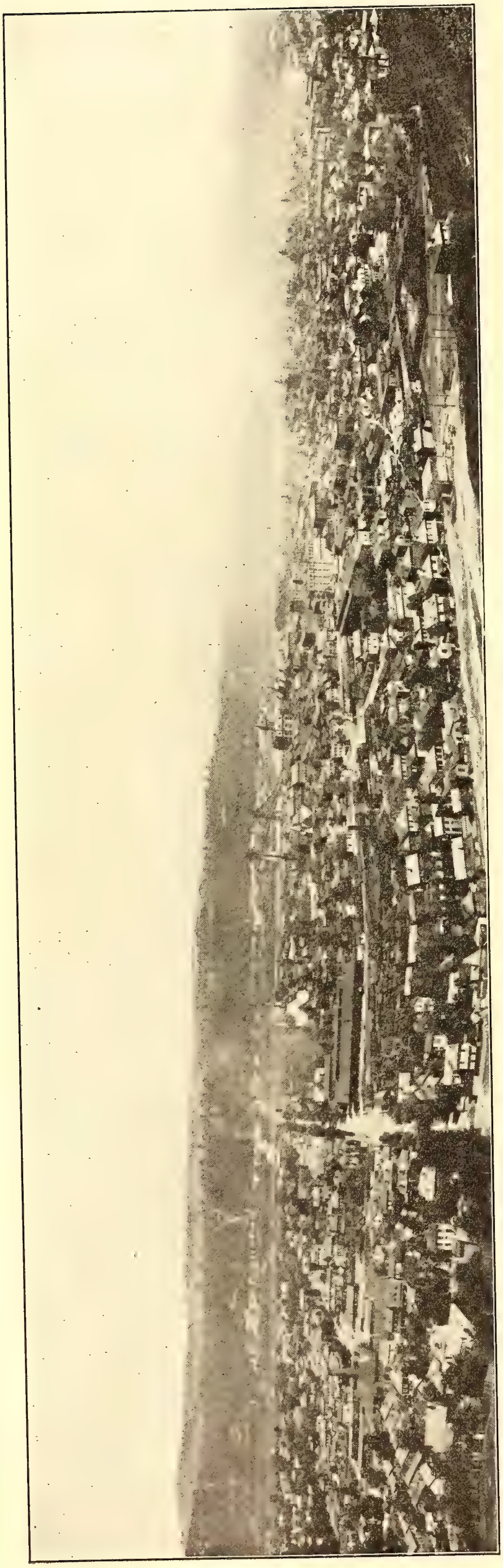
	Approximate Distance in Miles
Center of Rochester, Pa., to westerly city limits of Beaver, Pa.	4.50
This section will be operated by traffic agreement over lines of the Beaver Valley Traction Company. The route is through business and residential streets.	
Beaver to State line (easterly city limits of East Liverpool, Ohio)	11.17
This is a rich suburban territory. The tracks run through the main streets of the prosperous villages of Industry, Midland (a new and promising town site) and Smith's Ferry.	
State line to southerly city limits of Wellsville	12.00
This entire section with the exception of about a mile is through the main streets of the twin cities of East Liverpool and Wellsville, and of Chester, W. Va., serving a thickly populated residence and manufacturing district.	
Wellsville to northerly city limits of Toronto, Ohio	7.63
This is well populated suburban territory with several villages and many large factories and mills.	
Northerly city line of Toronto to southerly city line of Toronto	4.00
This route is through the city streets of Toronto—a thriving city, long-drawn-out, with many factories and mills.	
Toronto to the northerly city limits of Steubenville	6.00
This is good suburban territory, with a nearly continuous stretch of houses and mills along the route.	
Northerly city limits of Steubenville to center of city	2.00
This route is through the city streets of Steubenville.	
Total mileage of route	47.30



THE EAST LIVERPOOL AND WELLSVILLE SYSTEMS OF THE EAST LIVERPOOL TRACTION & LIGHT COMPANY

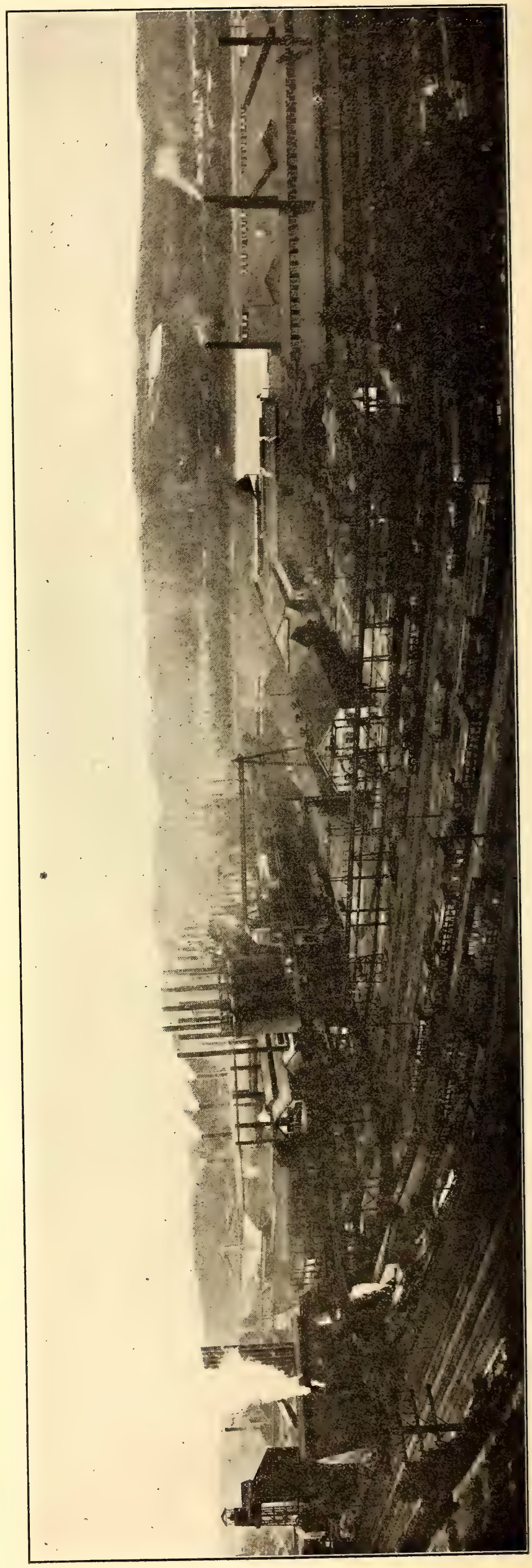


In the large map the properties of the Ohio Valley Finance Company are indicated by the cross-hatched lines.



(Photograph Copyrighted, 1905, by Filson & Son.)

BIRD'S-EYE VIEW OF STEUBENVILLE FROM THE BLUFFS BACK OF THE CITY. THE PANORAMA SHOWS HOW THE CITY IS BUILT ALONG THE NARROW STRIP OF BOTTOM LAND BETWEEN THE RIVER AND THE BLUFFS



(Photograph Copyrighted, 1905, by Filson & Son.)

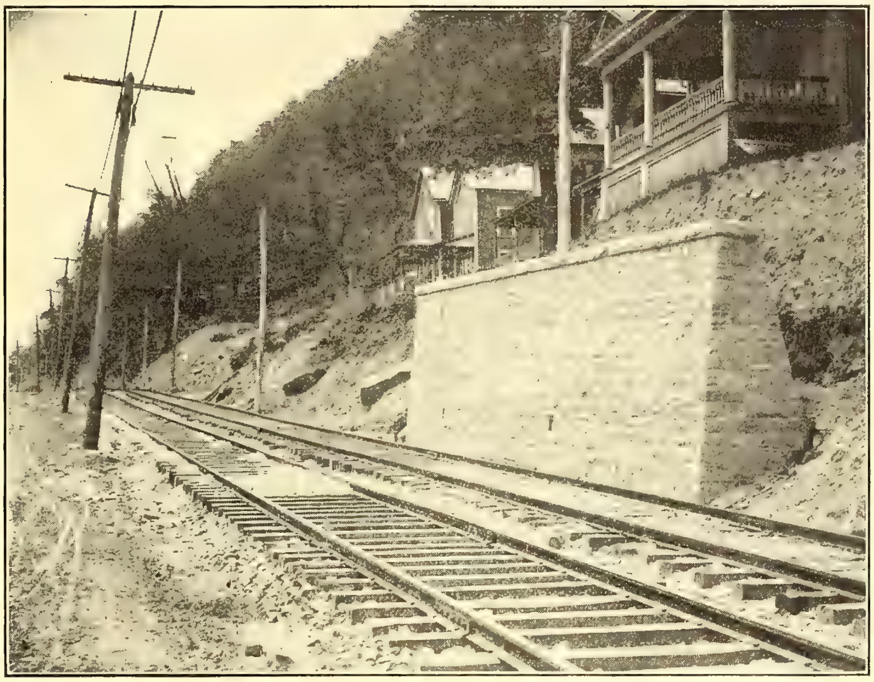
THE "HALF MOON BEND," STEUBENVILLE, SHOWING A PORTION OF THE MILL DISTRICT

Referring to the map, the intention of the interests identified with this development is to establish along the Ohio side of the river a thoroughly modern electric railway route from the Pennsylvania Railroad station in the city of Rochester, Pa., to the center of the city of Steubenville, Ohio, serving, by means of existing lines and by the building of connecting lines, the villages of Industry, Midland and Smith's Ferry, the twin cities of East Liverpool and Wellsville, the villages of Yellow Creek, Port Homer, Stratton, Empire and Freemans, the cities of Toronto and Steubenville, besides a prosperous and almost continuous suburban population between the villages and towns. Included, also, as tributary territory is a strip of river land now without proper transportation facilities extending for the entire distance along the West Virginia shore of the river. In this strip are many important towns and villages, which are connected to the Ohio side by numerous ferries and several bridges.

The road is to be constructed of 85-lb. A. S. C. E. T. rail in 60-ft lengths, laid on white oak ties, on a roadbed ballasted with gravel and crushed stone, with grades and curves which will permit of schedule speeds approximating 25 to 30 miles per hour. The road will be double track throughout its length. In all cases the location of the routes will be above the highest recorded high-water mark.

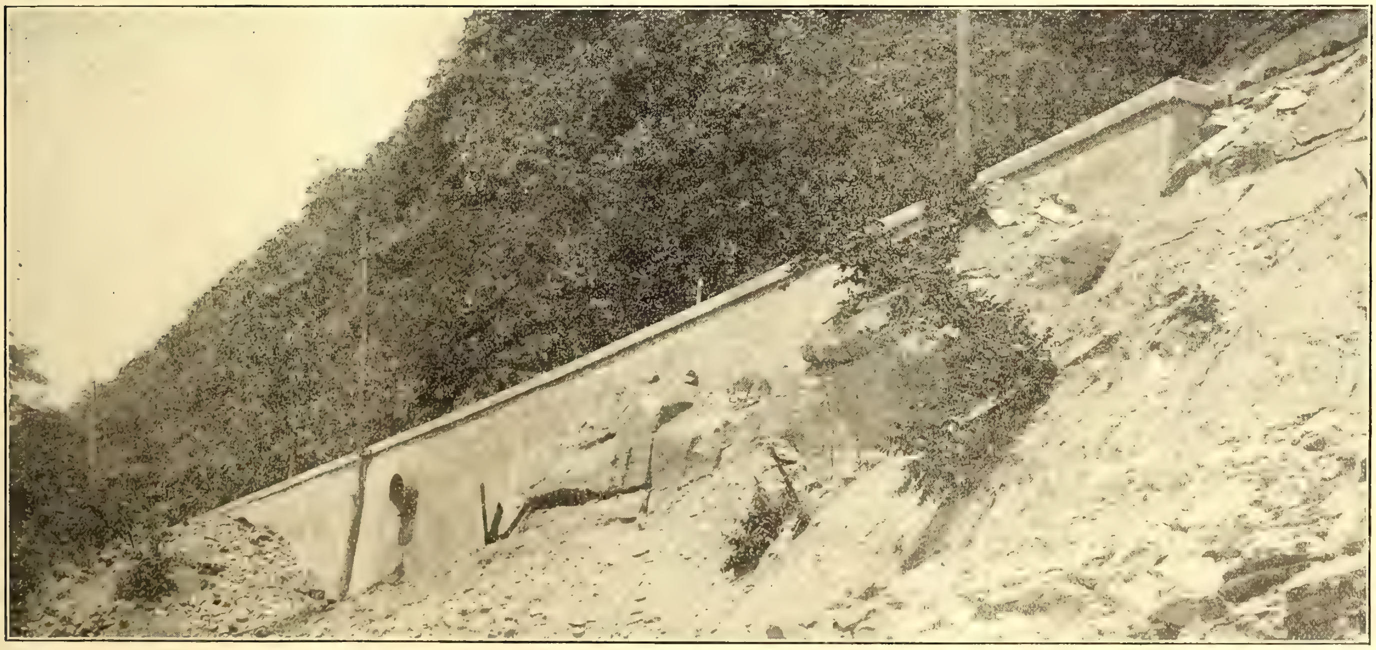
For financial and operating convenience the 50-mile route will be built in three sections. The section from Beaver to the State line (coincident with the easterly city limits of East Liverpool), will be constructed by the Ohio River Passenger Railway Company, a Pennsylvania corporation, which has a traffic agreement with the Beaver Valley Traction Company under which its cars will run through Beaver to a terminal at the Pennsylvania Railroad station in Rochester, Pa.

The section from the State line to the southerly city limits of Wellsville is now owned and operated by the East Liverpool Traction & Light Company. This company is an Ohio corporation and has acquired the properties of some eleven original railway, power, light and coal companies, thereby giving it the entire electric railway and lighting business in the cities of East Liverpool and Wellsville, Ohio, and Chester, W. Va., and vicinity.



NEW TRACK ON PRIVATE RIGHT OF WAY

The section from Wellsville to Toronto will be built by the Steubenville & East Liverpool Railway & Light Company, also an Ohio corporation. This company is to acquire the properties of the Steubenville Traction & Light Company and the Toronto Electric Light & Power Company, thereby giving it the entire electric railway, power and lighting business, between and within the cities of Toronto and Steubenville. The company connects with the Tri-State Traction Company, which owns and operates an electric railway on the



CONCRETE RETAINING WALL BETWEEN EAST LIVERPOOL AND WELLSVILLE

West Virginia side of the Ohio River between Steubenville and Wellsburg, from which last named point a line of the Wheeling Traction Company operates into Wheeling. It will also connect at Steubenville with a new line from Steubenville to Wheeling on the Ohio side of the river, now under construction by the Wheeling Traction Company.

TYPICAL CONCRETE CULVERT

All three of these corporations are owned and controlled by the interests identified with the Ohio Valley Finance Company, and by a tripartite agreement through cars will be operated over all the lines of all the companies, from the center of Rochester, Pa., to the center of Steubenville. Under the tripartite agreement the through line equipment will be jointly contributed by the three companies party to the contract. This agreement also provides for joint supply of power, joint car house, repair and storage facilities and joint executive and administrative organization whereby material and mutual benefits and economies will accrue to each of the companies. The officers of the three corporations are as follows: President, Van Horn Ely; secretary and treasurer, Edward McDonnell; general manager, J. C. Rothery.

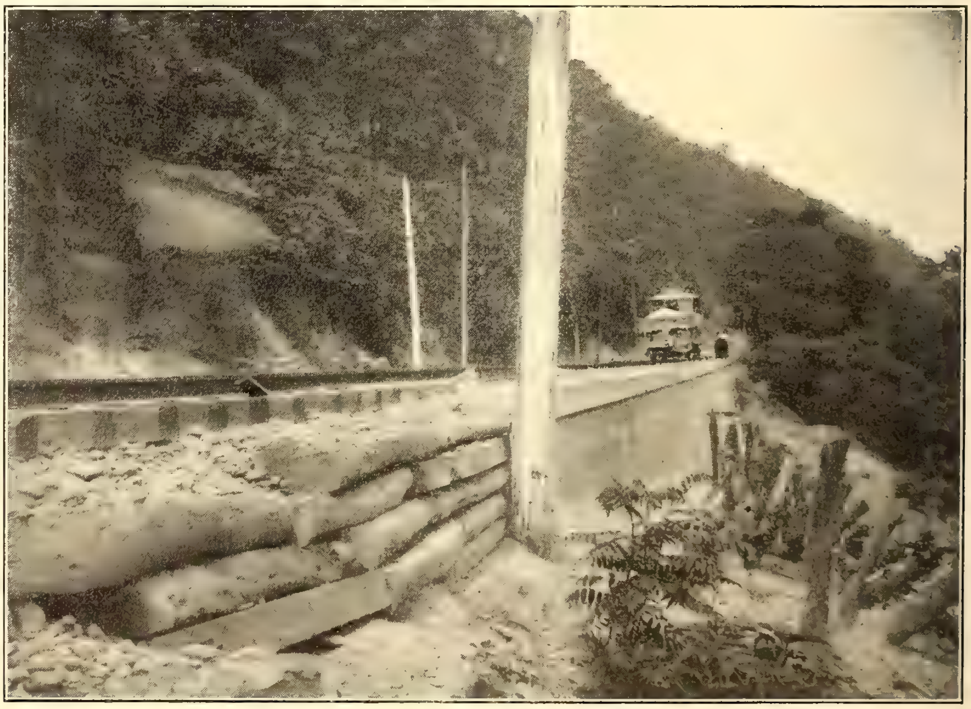
THE ROUTE IN DETAIL

Beginning at the westerly city limits of Beaver, where physical connection will be made with the line of the Beaver Valley Traction Company, the route runs a short distance north of the Pennsylvania Railroad tracks along the hillside, by easy grades, and for a short distance involving some hill cutting. Thence the road continues on a natural ledge with easy side hill cutting and slight grades and curvatures for a distance of 2 miles; thence through a flat bottom land with easy construction for a distance of 2 miles to the village of Industry. The line passes through the main street of this village. From the village of Industry, for a distance of approximately 1 mile, the route continues by side hill cutting just north of the present railroad tracks of the Pennsylvania Railroad by agreement with the railroad company.

For the greater portion of this section the highway, which at present is on the south side of the Pennsylvania Railroad, will be carried with the electric railway tracks on the north side of the railroad, thereby avoiding two dangerous grade crossings. It may be said in this connection that grade crossings have been eliminated throughout the entire route, either by moving the line of the highway or by steel trestle work or overhead structures.

The road then continues by easy work for a distance of 2 miles, passing through the main street of Midland, where extensive steel, iron, coke and other works are being established. The road then follows the north side of the highway with comparatively easy hillside work to Smith's Ferry, a distance of 1½ miles. At Smith's Ferry the road will turn south and cross the Pennsylvania Railroad tracks by means of a steel trestle about 400 ft. long to the south side of the railroad. The highway will also be carried with the electric railway tracks over the trestle at this point, thereby avoiding another grade crossing. Thence the route follows the south side of the railroad by easy work, with practically no grades through the main street of the village of Smith's Ferry, and over Beaver Creek by means of a bridge 300 ft. long. Thence it runs on a tangent to the State line, a distance of 1½ miles. Just beyond the State line the route turns to the north, and after crossing the steam railroad tracks on a 100-ft. bridge connects with the present tracks of the East Liverpool Traction & Light Company near the easterly city limits of East Liverpool.

The route from this point to the southerly city limits of Wellsville is over the routes already built and in operation. All of the lines have been reconstructed with double track and with the intention of avoiding excessive curves and grades and grade crossings in order to provide a high-speed route. At two points in East Liverpool grade crossings have been avoided by changing the location of the old tracks from the highway to private right of way; at another point a deep ravine, as well as a grade crossing with



TYPICAL SECTION OF TRACK ON HILLSIDE

the switch line of the Pennsylvania, have been avoided by the construction of a trestle 660 ft. long, which also serves the purpose of reducing the curvature at this point from 90 degs. to 20 degs. These improvements have also materially shortened the route and will cut down the running time from 30 minutes to 11 minutes between East Liverpool and the suburbs to the east.

From this trestle the route is in paved streets for one-half mile to a steel viaduct 465 ft. long. Then for 1 mile the tracks are in the highway. The route then follows along the north side of the Pennsylvania on private right of way to the easterly city line of Wellsville; thence through the city streets of Wellsville to the southerly city line of that city.

From this point a new double-track line will be built to the village of Toronto, a distance of about 8 miles, as follows: Leaving Wellsville, where connection will be made with the present tracks, the route runs in a southerly direction along the foot of a rocky bluff for a distance of 2800 ft., at which point a cut will be made for a distance of 450 ft. additional in the face of the rock. This cut will rise with a grade of 2.5 per cent to a height of 21 ft. above the main line of the Pennsylvania tracks, which leave the Ohio Valley at this point (known as Yellow Creek) for Cleveland. From this location a steel bridge will be constructed, approximately 800 ft. in length, across Yellow Creek. From the south line of Wellsville to the southerly end of this trestle the highway, which is at present between the railroad tracks and the river, will be carried with the electric railway tracks north of the Pennsylvania, thereby avoiding several dangerous grade crossings of the steam railroad tracks.

From the southerly end of the Yellow Creek bridge, the tracks follow the highway for a distance of about 1200 ft., from which point the road will be constructed just east of the highway and between it and the tracks of the Pennsylvania for a distance of about 4000 ft. Along here some heavy side hill construction is necessary, requiring in some places retaining walls on the lower side of the roadbed. The grades will range from 1½ per cent to 3 per cent, with very slight curvature. This is the most difficult piece of construction on the entire route, but presents no serious engineering problems. This part of the route will furnish an exceptionally picturesque feature, and an excellent view of the Ohio Valley to the north and south will be obtained. After leaving this heavy construction, for a distance of about a mile to Port Homer station, the tracks will be constructed partially in the highway with no extraordinary cuts or fills. This piece of track is practically on a tangent, with no grade over 1 per cent. At Port Homer the tracks will be carried by an overhead crossing over the Pennsylvania Railroad at an elevation of 21 ft. upon a steel trestle and a fill upon the eastern approach. This trestle will be about 200 ft. long and the fill about 300 ft. The track is brought to the general level of the valley after leaving the trestle and from here to Toronto will be easy construction, with light grades and curves. This last mentioned section is about 4 miles long and passes through the villages of Empire and Ekeyville (to be known in future as Stratton). For about one-third of this distance the tracks are located in the highways and the balance is on private right of way.

NEW DOUBLE TRACK IN WELLSVILLE

FILL BETWEEN EAST LIVERPOOL AND WELLSVILLE

From the northerly city line of Toronto there is in operation a single-track line into the heart of Steubenville. This route will be double-tracked, and in many cases both the original track and the additional track will be moved to new locations in order to eliminate undesirable curves and grades.

The local system in the city of Steubenville has been well laid out to serve the city's transportation needs and certain of these local routes will also be double tracked. Plans are perfected for an extension which will be made to two of these lines in order to reach desirable residential sections on the bluffs adjoining the city, not now reached by street railway lines.

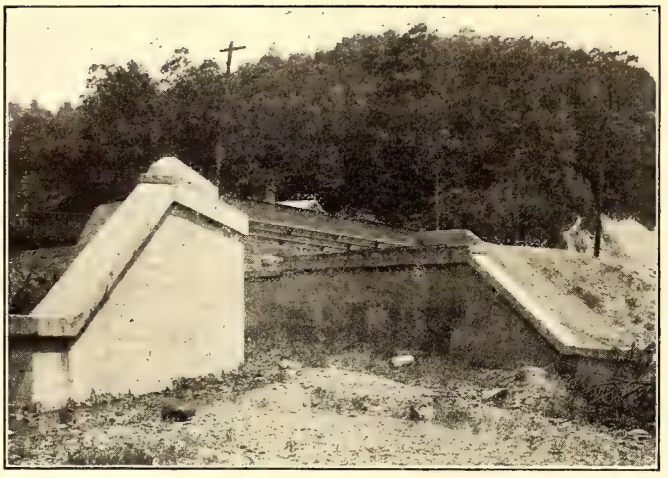


PLATE GIRDER BRIDGE WITH CONCRETE ABUTMENTS

In Steubenville, track connections will be made with the lines of the Steubenville and Wellsburg line, which has in operation a line over a suspension bridge at the foot of Market Street to the West Virginia side, and from there to Follansbee and Wellsburg, where connection is made with the lines of the Pan Handle Traction Company, operating between Wellsburg and Wheeling. In Steubenville connection will also be made with the Steubenville, Mingo & Ohio Valley route, which operates a line from Steubenville through Mingo to Brilliant, on the Ohio side of the river, and is now perfecting a connection with the lines of the Wheeling Traction Company at Martin's Ferry.

Thus will be completed a double-track electric railway route from Rochester, Pa., to Wheeling, of which route the section from Beaver to Steubenville, a distance of 50 miles, will be operated by companies affiliated with the Ohio Valley Finance Company.

POPULATION AND GENERAL INFORMATION

The Ohio Valley between Pittsburg and Wheeling is thickly populated. The two cities are about 91 miles apart, and throughout the entire distance cities, towns and villages are situated close to each other. The population of Greater Pittsburg is estimated at about 700,000; that of Wheeling and closely contiguous territory at upwards of 100,000, and the resident population along the river between the two cities at upwards of 200,000. Between Pittsburg and Wheeling there are three distinctive centers or districts of population of considerable size. About 17 miles below the Pittsburg district is the Beaver district, containing Rochester, Beaver, Beaver Falls and several other closely related communities, with a combined population of about 46,000 people. It is situated at the junction of the Beaver and Ohio Rivers on the Pennsylvania and the Pittsburg & Lake Erie Railroads. The territory between Pittsburg and the Beaver district is very thickly populated, and for a considerable part of the distance constitutes one of the most beautiful suburbs of Pittsburg.

Separated from the Beaver district by only 11 miles of intermediate territory is the East Liverpool district, embracing East Liverpool and Wellsville, Ohio; Chester W. Va., and contiguous towns and villages, having a combined population of about 45,000. The intermediate territory separating the Beaver district from the East Liverpool district contains the new town of Midland, where the Midland Steel Company is now erecting a very large iron and steel plant, and where the location of several allied industries is now assured.

Closely succeeding the East Liverpool district and separated therefrom by an intermediate territory only about 8 miles in length is the Steubenville district, embracing the city of Steubenville and other closely related towns and villages in Ohio and West Virginia, having a population of about 41,500. The territory between the East Liverpool and Steubenville districts contains the prosperous and rapidly growing city of Toronto, and towns and villages, aggregating about 18,900 population.

The map of the valley on page 334 exhibits graphically the names and relative distances apart of the cities, villages and towns together with their populations, either separately or in groups, and the location of the principal industries. It will be seen from an examination of the contour lines thereon that the hills vary in height from 700 ft. to 1200 ft. above the sea level, which is equivalent to from 200 to 700 ft. above the river.

The Ohio River in this section of the valley is being improved by the United States Government. A series of dams is being constructed, which, when completed, will make the river navigable throughout the year. The river steamers are of a peculiar type of construction and will be able to land at any point along this portion of the stream, thereby rendering the table-lands very desirable for manufacturing sites.

ENTRANCE TO STANTON PARK, STEUBENVILLE

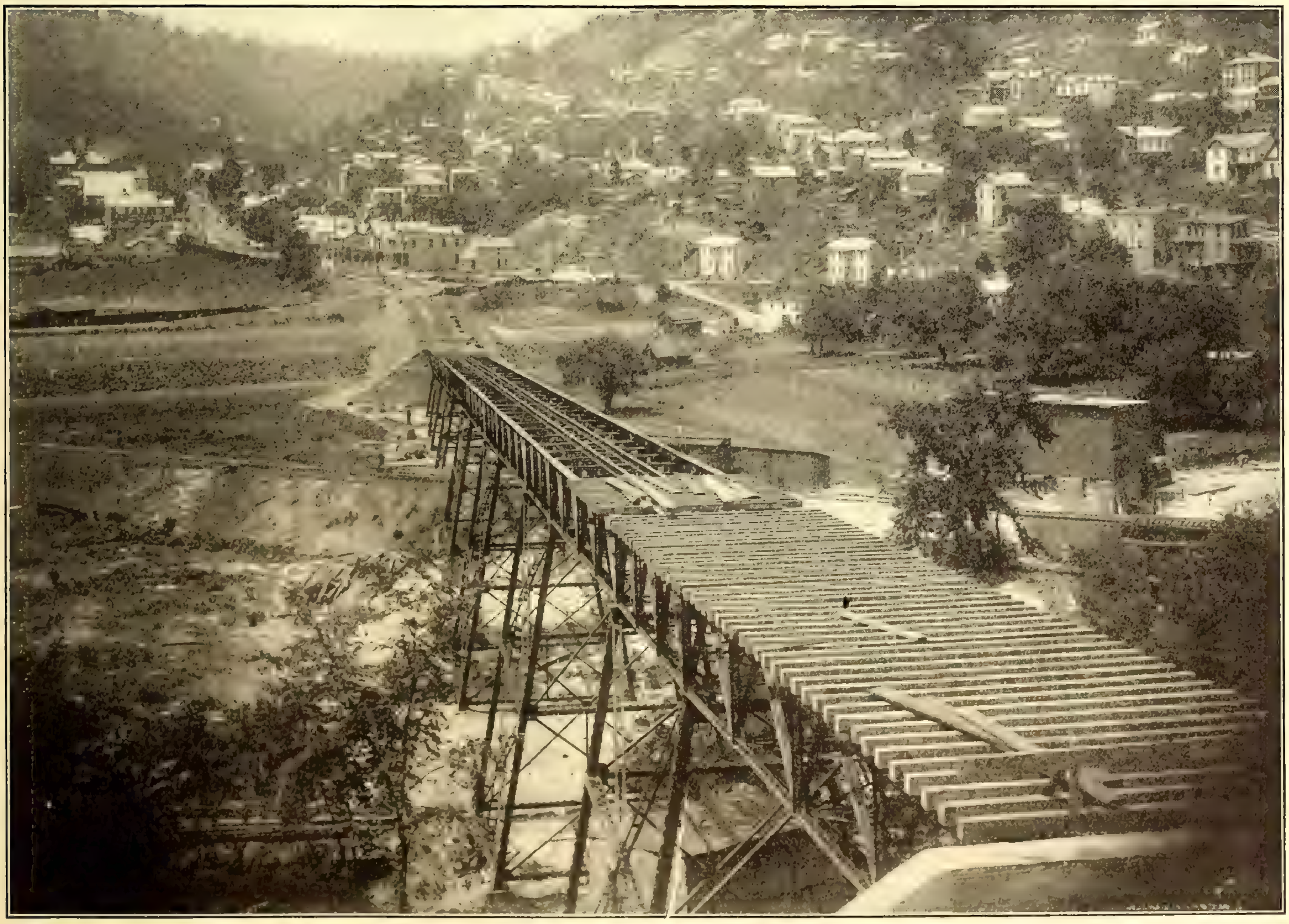
The cities of Pittsburg and Allegheny are served by the lines of the Pittsburg Railways Company, whose lines extend down the river toward Rochester on the east side of the river as far as Dixmont, and on the west side of the river as far as Coraopolis. The Beaver district is served by

the lines of the Beaver Valley Traction Company, extending toward Pittsburg as far as Conway on the east side of the river and Monaca on the west side, and toward East Liverpool as far as the westerly limits of Beaver. This property is owned by the Pittsburg Railways Company, which has in contemplation the connection of the two systems. The building, therefore, by the Pittsburg company of the few miles of railway yet remaining to be constructed between Allegheny and Beaver, and the construction of the lines between Beaver and East Liverpool and Steubenville will connect by lines of electric railway Pittsburg and Wheeling and all the intervening cities in the Ohio Valley.

The lines of the Ohio River Passenger Railway Company and the Steubenville & East Liverpool Railway & Light Company will form a very important part of these through-line routes and will themselves serve directly a population of upward of 150,000.

In estimating this tributary population, one-half of the population of the townships bordering on the river was taken and to this was added the population of all cities and villages on both sides of the river. The estimates of earnings were based for the southerly section of the route on $12,000 per double-track mile or $1 per capita for the population served, including the terminal cities. The estimated earnings for the section from East Liverpool north

A VIEW OF THE RIVER FROM STANTON PARK, STEUBENVILLE



TRESTLE 600 FT. LONG CROSSING FREIGHT LINE OF PENNSYLVANIA RAILROAD IN EAST LIVERPOOL

were based on gross receipts of $12,000 per mile of double track or $1.40 per capita, including terminal cities and towns. The single-track line between East Liverpool and Wellsville earned between $12,000 and $14,000 per single-track mile in 1905.

In connection with the through route up and down the valley, an extension will be built eventually to Lisbon, as indicated on the large map, thereby making tributary to the companies' lines a large amount of travel from the north.

The proposed double-track electric railway from Rochester through East Liverpool to Steubenville will supply a need not now adequately filled by the steam railroads, as the main lines of the Pennsylvania Railroad Company do not touch the greater portion of this valley, while the Cleveland & Pittsburg division, which does operate through this portion of the valley, is largely given over to freight business, and there are only six trains carrying passengers between the towns every 24 hours. The electric road will therefore be an important feeder to the main steam railroad trunk lines both at Rochester and at Steubenville.

ARTIFICIAL LAKE IN STANTON PARK, STEUBENVILLE

FRANCHISES

In locating the route, endeavor has been made to secure private rights of way wherever possible, and in view of the fact that the valley is so narrow and the available strip of bottom land is already occupied by the single highway which traverses the length of the valley and by the tracks of the Cleveland & Pittsburg division of the Pennsylvania lines, the position of the companies would appear to be absolutely impregnable as far as future electric competition is concerned. The franchises in the cities of Ohio are for 25 years, the former grants having just been renewed for that period. This is the limit of the term of franchises in city streets fixed by the Ohio law, but they may be, as has just been the case, renewed and extended at any time for like periods of 25 years each. The franchises in counties of Ohio outside of cities are for 50 years, and the portions of streets and highways upon which consents have been secured are intermingled with the stretches of private right of way both in and outside of cities, thus giving in ultimate results the effect of long-term grants for the route in its entirety. For the portion of the route located in the State of Pennsylvania the consents and franchises are in perpetuity.

PHYSICAL FEATURES

On the route from Beaver to Steubenville there are four power stations, three combined railway and lighting plants and one lighting station. All railway power is generated at 550-600-volt direct current. The railway power houses are located respectively at East Liverpool, Wellsville and Steubenville.

The railway units at the East Liverpool station include one 500-kw direct-connected unit and one 250-kw and one 200-kw belted units. The plant at Wellsville, in addition to the

lighting units, contains two 200-kw direct-connected generators for railway purposes. The Steubenville plant contains two 400-kw and one 300-kw direct-connected railway units, and one 200-kw railway unit driven by vertical compound engine. In addition to these generating stations a 400 amp-hour storage battery is maintained at Stanton Park, just outside of the city limits of Steubenville, and this is used as a floating battery on the line to take care of excessive peaks.

The power scheme for the combined properties has not yet been perfected, but it will probably be based upon the generation of direct current at the present power houses with provision for such additional power as may be required.

The East Liverpool Traction & Light Company owns fifty-five cars of different types, of which twenty-five cars are required to fill the regular schedules. The Steubenville Traction and Light Company owns thirty cars, of which sixteen are in regular service. The East Liverpool Traction & Light Company also owns a steel suspension bridge over the Ohio River at East Liverpool, and over this bridge operates a double-track line to Chester, W. Va., and Rock Springs Park. The bridge, with approaches, is 1710 ft. long, and has a center span of 705 ft. The East Liverpool Traction & Light Company has it own coal mine and mines all its own coal. The mine is located near East Liverpool, and the company is taking out from 60 to 100 tons of coal per day. The same company also owns Rock Springs Park, in Chester, W. Va., directly opposite East Liverpool, across the Ohio River. This park constitutes the main pleasure resort of this section of the valley and is an excursion point for a wide territory. The steam roads alone carry to the park upwards of 125,000 excursionists a year. The resort is more than usually well located and is fortunate in its natural beauties. These have been enhanced as drawing attractions by the addition of many amusement features, including dancing pavilion, theatre, swimming tank, "aquarama," figure 8 coaster, shoot the chutes, restaurant, merry-go-round and other novelties. An agreement has been made whereby Rock Springs Park has been leased for a period of ten years to an amusement company, which has spent upwards of $75,000 on park attractions. This arrangement secures to the railway company all the benefits of the park as a stimulant of traffic and a revenue of the rental with none of the expenses usually occasioned by street railway companies by such attractions. The novel features of the park will be described in a later article.

The thanks of Gov. Curtis Guild, Jr., extended to General Superintendent E. P. Shaw, Jr., and to the Boston & Worcester Street Railway for the voluntary service it performed at South Framingham recently, when by the collapse of a business block twelve lives were lost, are conveyed in the following letter addressed to Mr. Shaw:

Sir—By the direction of his Excellency, the Governor, I have the honor herewith to transmit to you an official copy of the report made to this office by Brigadier-General Whitney, commanding Camp Bancroft, on the late Amsden block disaster at South Framingham. This copy is furnished you for the reason that it acknowledges and commends the very material assistance rendered both by you in person and by the men of your corporation, whose services you as promptly tendered.

I am further directed by his Excellency to convey to you his personal acknowledgements for your services, and to express to you his appreciation of the public spirit shown by you and those under your direction at this time of grave emergency. Very respectfully, JAMES A. FRYE,
Adjutant-General, Chief of Staff.

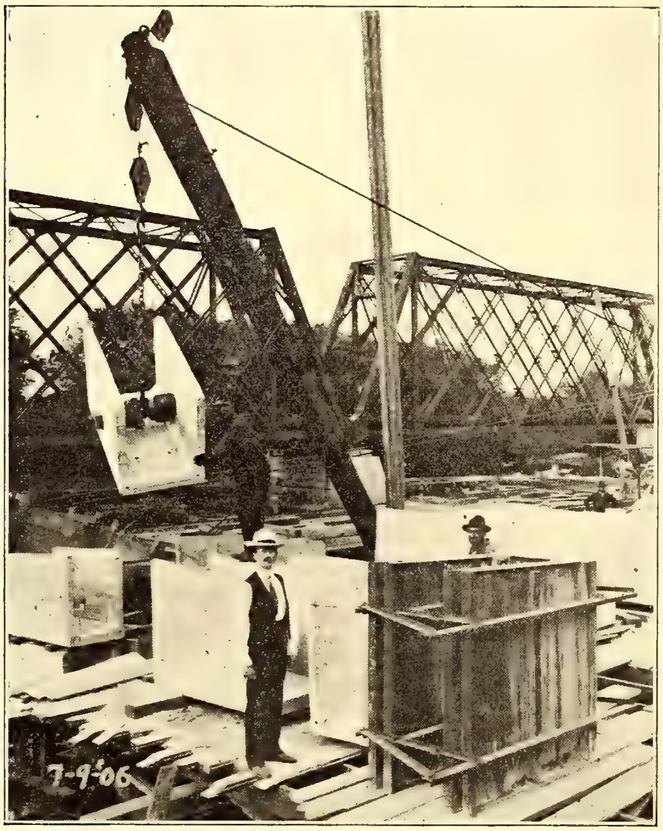
A SINGLE-TRACK, REINFORCED-CONCRETE ELECTRIC RAILWAY BRIDGE NEAR BELVIDERE, ILL.

A novel single-track, reinforced-concrete bridge, 350 ft. long, comprising four arches of 81 ft. clear span each, has recently been completed on the line of the Elgin-Belvidere Electric Railroad over the Kishwaukee River about 2½ miles east of Belvidere, Ill. Each arch of the bridge has a circular intrados with a radius of 83.36 ft. and a rise of 10.5 ft., the piers being spaced 87.5 ft. apart on centers. The arches each have two longitudinal arch ribs, 8 ft. 10 ins. apart on centers. These ribs are 2.5 ft. wide in their entire length, but vary in depth from 3 ft. at the crown to 4 ft. 6½ ins. at the haunches of the arch. Each rib carries a 12-in. spandrel wall centrally deposed above the rib and built up to the horizontal plane through the extrados of the arch at the crown. For lateral stiffness, the two ribs of each arch are connected by eight transverse beams in each span, which beams are spaced at equal distances longitudinally along the arch. On these beams are 12-in. cross walls built flush at the top with the spandrel walls, and on the latter and the cross walls the floor slab of the bridge is carried. This slab is 6 in. thick and 14 ft. wide. At the side of the floor slab is a curb, 8 in. high, built to confine the ballast of the roadbed. Drain holes are provided in the floor slab at intervals. At each of the piers a pilaster is brought up on each side of the bridge to within 3 in. of the ledge of the floor slab to support holes carrying the trolley wire of the electric line. Seats are provided at the abutments for the connection of trestle approaches to the bridge.

The water level in the stream across which the bridge has been built is about 3 ft. below the springing line of the arches at low stages, while in extreme floods it rises to within 5 ft. of the intrados of the arch at the crown. The bridge was so designed that in its erection all centering and false-work could be eliminated, thus avoiding many of the difficulties entailed by the use of timber falsework and centering. The ribs of the arch ring were built in trough-shaped reinforced-concrete forms. These trough-shaped forms were divided into seventeen sections for each rib, making each section 2½ ft. wide over all and 4 ft. 11 11-16 ins. long at the bottom. These sectional forms were 3 ft. deep at the crown and 4 ft. 6½ ins. deep at the haunches of the arch, the intermediate sections being graduated in depth between these two dimensions. The sides of the sectional forms were 3 ins., and the bottom 4 ins. thick, the ends of the trough section in each case being omitted. In these hollow sectional forms was placed, after they had been erected, the core or arch rib proper, which was 2 ft. x 2 ft. 8 ins. in cross section at the crown and 2 ft. x 4 ft. 2½ ins. in cross section at the haunches of the arch. The corners between the sides and bottom of each form were filled out with concrete. Each of these sectional forms was reinforced with ⅜-in. plain round steel rods placed 8 ins. apart on centers longitudinally and 12 ins. apart on centers transversely. The weight of sections varied from 1500 to 2200 lbs.

The sectional forms of the arch ribs and those for the transverse beams connecting the pairs of the latter in each arch were cast in a series of steel molds. These molds were built of No. 16 sheet steel stiffened by 3-in. steel channels and held in alignment by angle irons so arranged and connected that each mold could be knocked down and reassembled readily. In all, 136 sectional rib forms and 32 transverse beam forms had to be cast. Since each rib was symmetrical about the transverse center line of the arch, only nine different kinds of sectional forms were required for the ribs. One steel mold was sufficient for the transverse

beams. By inserting loose wooden strips in the proper position between the inner and outer side pieces of the mold the variation in the depth of the rib forms was readily effected. The sectional rib forms were cast with the molds standing



STEEL MOLDS AND DERRICK HANDLING SECTIONAL FORMS

vertically so that one voussoir face was against the working platform on which the mold stood while the other was flush with the top of the mold. The concrete in these rib forms was made very wet in the proportion of one of cement and three of sand and filled the steel molds thoroughly.

A hole was cast in the side of each sectional form at about the center of gravity of the latter, and through these holes attachments were made for handling the forms after they had set. Those pairs of sectional forms in each of the arch ribs which are connected by the transverse beams had two rectangular openings cast in one side to facilitate this connection, the openings being made by fastening wooden blocks to the mold before the concrete was placed in the latter. The sectional forms hardened rapidly enough so that it was possible to remove the steel molds twenty-four hours after the concrete had been placed in them. When the sectional rib forms had all been completed they were numbered and stored at the site until required in the structure.

In the meantime two longitudinal rows of piles were driven on both sides of the bridge. These rows of piles were capped with 2-in. x 10-in. transverse plank braced in both directions by 1-in. boards. On top of the caps 6-in. x 10-in. stringers were laid, and on these stringers were placed two rails for a light tramway. A traveler spanning the site of the arches was mounted on these two parallel tramways. This traveler was fitted with two triplex blocks, each carrying a balanced beam made up of two 8-in. channels. At the proper time the sectional forms for the arch ribs were lifted to a platform on the temporary bridge by a guyed derrick. The corresponding sectional forms for the two ribs of each arch were then assembled in pairs and spaced the same distance apart transversely they were to be placed in the bridge. Two 4-in. x 6-in. timbers were then placed transversely under each pair of sectional forms and bolted to two other 4-in. x 6-in. timbers placed transversely over the top of the pair of forms by bolts extending up through holes in the bottom of the forms. The pair of forms was thus firmly held in a lifting frame to which were attached hooks on the balanced beams carried by the triplex block on the traveler. A pair of forms would then be lifted into place in the two arch ribs and suspended there as well, as explained later. In this way the two ribs of each arch were erected simultaneously, and where a pair of rib forms were connected by the forms for transverse beam the three were placed as a unit.

The erection of the arch ribs was started simultaneously from each haunch, the first pair of sectional forms being supported at one end on the skew-back and at the other end attached to a set of steel rods suspended from an A-frame at the end of the arch. One of these A-frames was set at the abutment and anchored back to the piers of the trestle approach to the bridge; the other A-frame for the first arch was set on the pier at the other end of that arch and anchored back to the second pier. The anchors for each A-frame, consisting of 1⅜-in. round steel rods, which were in 16-ft. lengths, connected by sleeve nuts. Turnbuckles were also provided on these rods so that the length of the anchors could be adjusted. A series of eight 1⅛-in. round steel rods, each provided with a turnbuckle, radiated from the top of each A-frame. These rods each supported two shorter 1-in rods diverging to the sectional rib forms. These shorter rods were connected to U-bolts on the lifting frame carrying the assembled pairs of sectional rib forms, and supported the latter until the rib forms for one arch had been placed.

PLACING KEYSTONE IN ARCH

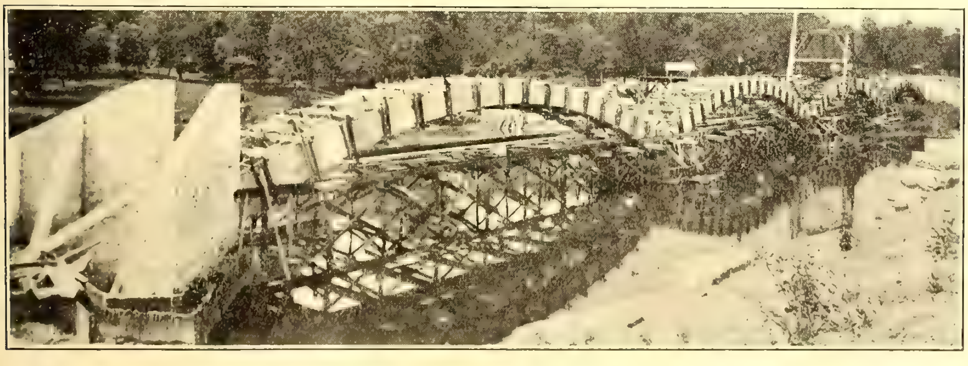
In addition to the 4-in. x 6-in. timbers of the carrying frame in which the pairs of rib forms were assembled, two light wooden frames on each pair of forms were used to brace the latter. The second sectional pairs of forms were brought into position after the first had been placed, and the two sections of that pair supported at one end on the two sections

of the first pair and at the outer end by the second set of rods attached to the A-frame. The connection between the sectional form was made by steel dowels placed in gas pipes built into the inside lower corners of the sections as the latter were cast, and in some cases by wooden blocks fitted to the inside of the section. In this manner the remainder of the sectional forms were placed in position and supported.

The keystone of each set of arch rib forms required no support other than that supplied by the two sectional forms adjacent to it. When the keystones had been placed, the rods attached to the A-frames supporting the sections of the forms were slackened and the two halves of each arch rib form allowed to close against the keystone of the latter. The entire set of sectional forms comprising those for each arch rib then became self-supported and the A-frames with their anchors and rods were removed and used in a similar manner for the erection of the forms for the pair of ribs of the next arch. The lifting frames on each pair of sectional forms were removed as soon as the span was completed, but the bracing frames between the pairs of forms were left in position until the concrete had been placed in the sectional rib form.

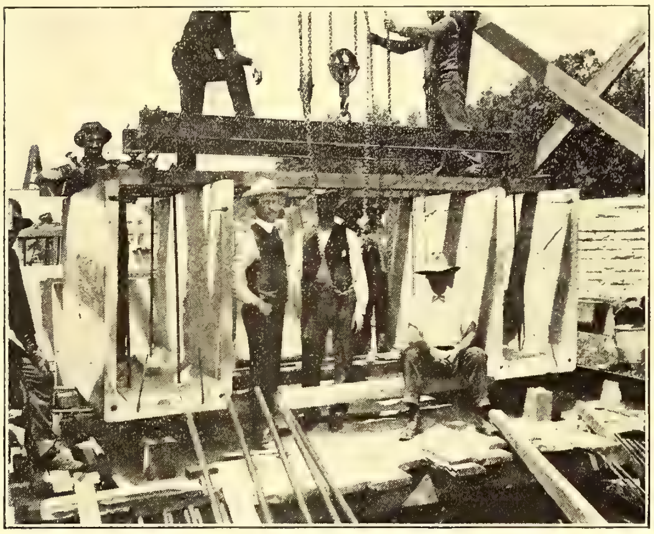
In calculating the A-frame supporting rods the assumption was made that the sectional forms were supported at two points while being placed, which condition was actually established in the erection. The suspension rods were also adjusted that the joints between the various sectional forms were left open slightly at the top.

To insure the proper fitting of the keystone, the faces of the skew-backs on the piers were dressed before erection was started so as to make the angle between the face of the skew-back and the horizontal plane through the springing line slightly less than that calculated. In addition, the lower edge of the first sectional form was rounded in order to keep the pressure from being applied too close to the edge, and in the joint a strip of sheet lead, 1/8 in. thick, was placed. The turnbuckles on the anchor rods made it possible to raise or lower half of the arch rib forms as a unit, the rotation taking place about a horizontal axis near the lower edge of the first sectional form, with an effect practically the same as if a hinge had been inserted in the joint at the skew-back. In this way the opening in the center for the keystone was adjustable, so no trouble whatever was experienced in fitting the keystone in place. After the removal of the A-frames and supporting rods, all the joints were found tightly closed and the alignment was perfect.



NORTH ELEVATION OF BRIDGE. ALL SPANS ERECTED

The sectional forms for the ribs of all four arches were set in this manner before concrete was placed in any of them. This sequence of operation was necessitated by the fact that the piers would not have been stable under the unbalanced horizontal thrust caused by placing the concrete in the arch rib forms for one span before the skeleton arch of the adjoining span was erected. When the sectional forms for the ribs of the four arches were in place, the reinforcement was put in position in them. These ribs, together with the transverse beams, were then filled by first putting in a 12-in. layer



PAIR OF RIB SECTIONS CONNECTED BY LIFTING FRAME

uniformly over them and then following up with the remainder of the concrete. The concrete in the arch ring and the transverse beams were made continuous by the openings through the inner walls of the sectional forms, and the entire construction thus rendered monolithic. After the arch ring had been completed in this manner, the spandrel walls and floor slab were built in ordinary wooden forms.

The erection of the arch rings was successfully completed in a comparatively short time, notwithstanding the fact that only unskilled labor was employed. An average of three days was required to erect the sectional forms for the arch ribs of one span, and to take down and reset the A-frames with their anchorages. The sectional forms for the ribs of the last arch ring were erected in a day and a half. The largest number of sectional forms placed per day was 12 pairs. The entire superstructure of the bridge, including the arch rings, was completed in thirty days, which included three or four days' delay caused by labor troubles.

The sub-structure presents no features of special interest. The three intermediate piers were built of solid concrete, while the abutments were provided with buttressed wing walls, which, together with the walls and base slab, were all of reinforced concrete. With the exception of one pier and one abutment, the sub-structure was founded on gravel. At that pier quicksand was encountered, which caused a great deal of trouble and involved a delay of at least thirty days in the completion of the sub-structure. Some trouble was likewise encountered on this account at one abutment. A double-walled cofferdam was finally built around this pier and abutment and piling driven. The cofferdam was then sealed by depositing the concrete under water, after which the construction proceeded in the usual way.

The mixture of concrete for the piers and abutments was 1:3:5, and for the superstructure 1:2:4. The bridge was

built for a live load, consisting of a train of 40-ton interurban electric cars. Without considering temperature variations a unit compressive stress of 500 lbs. per sq. in. and a unit tensile stress of 500 lbs. per sq. in. is taken as the allowable stress in the concrete and 10,000 lbs. per sq. in. in the steel. Considering temperature variations of 40 degs. Fahrenheit above and below, the allowable unit compressive stress in the concrete is taken to be 650 lbs. and the unit tensile stress 75 lbs. per sq. in., with 13,000 lbs. per sq. in. as the allowable unit stress in the steel.

The stresses were figured for the arch fully loaded and half loaded, and were combined with the temperature stresses to produce the maximum. Only the concrete and steel in the core of the arch ribs was considered effective, but since the sectional forms actually carry a considerable part of the dead load, the factor of safety of the bridge is higher than ordinarily obtained in reinforced-concrete construction.

The reinforcement in the arch rings consists of ten ⅞-in. plain round rods in both the extrados and intrados of each arch rib, with shear rods as shown in one of the accompanying illustrations. The ⅞-in. rods are about 30 ft. long and were spliced by overlapping 3 ft. These rods were also continued into the foundation. The reinforcement in the spandrel walls consists of ⅜-in. round rods spaced 12 in. centers, horizontally and vertically. The reinforcement in the floor consists of ½-in. rods, 5½ ins. apart on centers, placed transversely near the bottom of the slab between the spandrel walls, every other rod being bent so as to be near the top in the outer part of the slab and to continue up into the curbs at the sides. There were also twelve ⅜-in. round rods spaced longitudinally throughout the floor and wired to the transverse rods.

The deflection of the arch ribs was observed, first, immediately after the erection of the four arch rings and before any concrete had been placed in them; again, after the concrete had been filled in the sectional forms to form the solid ribs; and then, after all the concrete had been placed in the spandrel walls and floor of the superstructure. The results are indicated in the following table:

BELVIDERE BRIDGE

Table of elevations and deflections observed at intrados of arch ribs at crown.

All elevations are 157′ +, but only decimals of feet are given. Elevation at crown as per design, 157.46. Average actual elevation 157.47.

Span No.	Elevations in Feet.			Deflections in Feet.		
	Before any Concrete was Placed.	After Concrete was Placed in Ribs and Diaphragms.	After Concrete was Placed in Walls and Floor.	Caused by Load of Concrete in Ribs and Diaphragms.	Caused by Load of Concrete in Walls and Floor.	Total Deflection Caused by Dead Load of Structure.
1 North Rib...	.43	.39	.37	.04	.02	.06
1 South Rib....	.38	.37	.34	.01	.03	.04
2 North Rib...	.65	.56	.54	.09	.02	.11
2 South Rib....	.49	.41	.39	.08	.02	.10
3 North Rib...	.63	.58	.55	.05	.03	.08
3 South Rib....	.60	.56	.53	.04	.03	.07
4 North Rib...	.54	.53	.49	.01	.04	.05
4 South Rib....	.57	.56	.52	.01	.04	.05
Average.....	.54	.50	.47	.04	.03	.07

The deflection caused by the filling of the concrete in the ribs is somewhat variable, which is probably due to the fact that the joints between the sectional forms may not have all been closed up completely. After the ribs have been completed, the deflection caused by the additional weight of concrete in the spandrel walls and floor is very regular. The total deflection in no case exceeds the normal, and the average elevation of the eight ribs at the intrados of the crown, after the completion of the structure, deviated only 1-100 of a foot from the calculated elevations.

The advantage of this type of construction is claimed to be the elimination of centering, which is always a large portion of the total cost of a concrete bridge, and in deep and swift rivers makes construction not only extremely expensive, but dangerous and hazardous. While for the sake of expediency in this bridge a traveler and a temporary track were used for erecting the reinforced-concrete forms, according to the designers, a cableway will be used in future work. With the latter arrangement, it is believed by them, concrete bridges can be built across streams of practically any character.

The outfit required to construct a bridge of this type involves a larger first cost, but after this outfit has once been acquired, it is said to enable the construction and erection of the sectional forms at very little cost and remarkable speed. The steel molds used on this bridge could be used, it is understood, in constructing a series of arches ranging in length from 25 ft. to 100 ft., and can be used repeatedly. Where a series of bridges is to be built at one time, this feature attains greater importance in reducing cost.

The Elgin-Belvidere Railroad is under construction by the Arnold Company, Bion J. Arnold, president, of Chicago. The bridge was designed and built by the Strauss Bascule & Concrete Bridge Company, of Chicago. The work was executed under the immediate supervision of K. Hojgaard, engineer for that company.

QUARTERLY MEETING OF THE NEW YORK STATE ASSOCIATION

President Shannahan announces that the next quarterly meeting of the Street Railway Association of the State of New York will be held at Albany, N. Y., on Sept. 19, 1906. The meeting, as usual, will take the form of a one-day conference, and will be devoted to subjects pertaining to the mechanical department at the suggestion of the New York Railroad Commission. Matters of considerable importance will come before the meeting, and a large attendance of both general managers and master mechanics is urged. The hour and place of meeting and also the detail topics to be discussed will be announced in a later notice.

HIGH-VOLTAGE DIRECT-CURRENT WORK ABROAD

In connection with the article published in the May 5 issue of the STREET RAILWAY JOURNAL on the high-tension direct-current railway between Cologne and Bonn, Germany, and also the article on high-voltage direct-current lines on the continent, published on page 959 of the June 16 issue, it may be interesting to mention the practice followed by the Siemens-Shuckert Works in placing the line of demarkation between low and high voltages for railway motors. The company has built for the Berlin Elevated Railway 700-volt to 800-volt motors of the standard type. These are insulated in the ordinary manner and have given no trouble whatever. Sparkless commutation has been secured by calculating the proper number of commutator laminations.

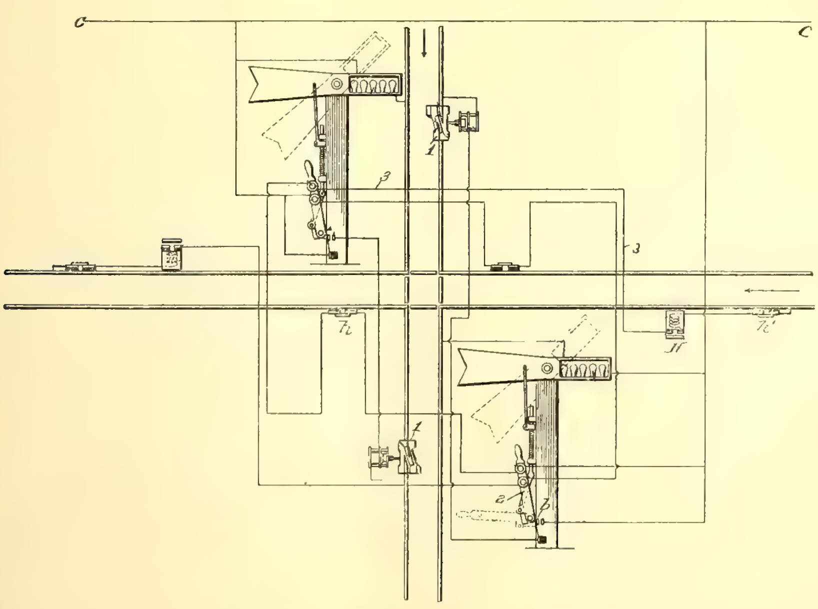
For tensions of 900 volts or over, the company has adopted the use of auxiliary poles to secure sparkless commutation. This method has given perfect satisfaction, in particular on the Cologne-Bonn line, which is operated at 990 volts. Aside from the use of inter-poles the only changes from the standard construction are superior insulation for the armature and motor casing. It was also mentioned in the article of June 16 that the company had built a 2000-volt direct-current line for operating a freight railway in the Mosel mines. From later advices it appears that the motive power of each locomotive is divided in two groups of two motors each. At starting both groups are in series, but for running are placed in parallel, so that two motors are always in series.

A SIGNAL SYSTEM FOR RAILROAD CROSSINGS

A patent for an ingenious system designed to prevent collision between electric and steam railroad trains at crossings was granted this week to Charles R. Barnes, expert of the New York Railroad Commission, and Alfred Green, formerly master mechanic of the Rochester Railway Company. The system provides in the electric track a derailing device which is normally kept open. It can, however, be closed by the conductor or motorman, who must first cross the steam railroad track and throw a switch. The open or closed condition of the derailing device is indicated by a semaphore by day and lamps at night. The principal feature of the invention is the arrangement by which the electric railway employee is prevented from closing the derailing switch if a steam railroad train, in approaching the crossing, has come within 1000 ft., or such other distance as may be decided upon as the danger zone. The system is illustrated in the accompanying plan.

In this engraving the steam railroad track is indicated by the horizontal lines and the electric railroad track by the vertical lines. If an electric car approaches the crossing in the direction shown by the arrow, it meets at 1 the derailing switch, which can be closed only by the electric employee drawing down the electric switch 2 on the other side of the steam railroad track. This switch is normally in the position shown by the solid lines, but when drawn down occupies the position shown by the dotted lines. This switch closes a circuit from the trolley wire *C* through contact *b* and the electro-magnet controlling the derailing switch, and thus closes the switch. At the same time the movement of the handle mechanically clears the danger signal. After the car has passed the crossing the electric railway employee releases the switch handle, which is drawn back by a spring and the danger signal is reset. The engraving shows a derailing device of a similar pattern for electric cars operating in the other direction.

The locking device which is actuated by the railroad train

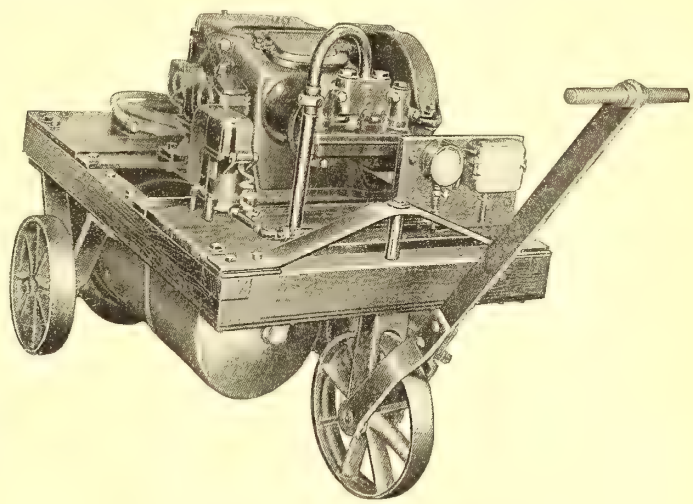


DETAILS OF SIGNAL SYSTEM FOR RAILROAD CROSSINGS

operates through the circuit closer *H*. This contact is closed by the car wheel and completes a circuit between the trolley wire *C* and the ground through the wires 3 and a magnet on each switch handle support. This magnet consists of a solenoid which, when the current passes, thrusts a pin through a hole in the switch lever and locks it in position. The circuit remains closed after the passage of the train until broken by one of the two circuit breakers at *h* and *h'*. The former is located just beyond the crossing and consists of a movable contact plate which is operated by the car wheel, after which all parts return to their normal position. The auxiliary circuit breaker *h'* is placed at a greater distance from the crossing than the contact maker *H*, and is installed to break the circuit caused by a train passing *H* and then returning to the right-hand side of the drawing, as would occur where an engine or train moved into proximity to the crossing and then backed away. The engraving shows a duplicate system to proctect the crossing from trains approaching from left to right. The system is, of course, applicable to double-track operation as well as single.

PORTABLE AIR COMPRESSOR OUTFIT

An especially neat and compact portable air compressor outfit has recently been placed on the market by the General



PORTABLE COMPRESSOR COMPLETE

Electric Company. A convenient means of obtaining a supply of compressed air for various purposes about power houses and car houses is in demand, and the new oufit admirably meets the requirements of such service. Compressed air is used in the power house for cleaning generators, converters, rotary and switchboards, and it has a wide application in car houses for cleaning dust from cars and trucks and removing copper and carbon particles from armature windings and controllers. In addition to the more apparent use of this compressed air outfit, small tools such as drills and chisels can be operated by such a compressed air supply. Being portable the entire set can be drawn to different parts of the power house or shop or put on cars and transported to sub-stations, the electrical connection with the trolley circuit is quickly made through a contactor box on the truck and a convenient length of hose used to convey the compressed air to the work. This eliminates waste of air due to necessarily long hose or leaky pipe connection.

This portable air compressor set consists of a standard CP 22 (24-ft.) air compressor similar to that used in the company's air brake systems, a governor, insulating connector, safety valve, gage, combined switch and fuse, two reservoirs 16 ins. x 48 ins., hose, contactor box, and stop-cock, all

mounted compactly on a three-wheel truck, as shown in the illustration. In the center of the truck is placed the air compressor and motor, with the governor at one side and the gage and circuit breaker mounted on a small board in front. The two steel reservoirs are carried beneath the truck floor, keeping the center of gravity of the outfit very low. The framework and tongue are of wrought iron, and the front wheel is hung in a pivoted fork of the same material.

The parts of this outfit are of the same standard and durability as the company's air-brake equipment for cars. The compressor consists of a 500-volt motor of the railway type connected by a herring-bone gear drive to a double-cylinder air compressor. The complete unit is entirely enclosed, with provision for thorough lubrication. The gearing runs in oil, making it as noiseless as possible. The governor is entirely automatic and thoroughly protected, and adjustments are provided so that the pressure at which it will act can be varied to open at any point between 60 and 100 lbs. per sq. in. of pressure in the steel reservoir. In addition to the governor an adjustable pop safety valve is provided which prevents the possibility of an excessive pressure on the reservoirs. In the combined switch and fuse, mounted vertically with the gage, all current-carrying parts are enclosed in moulded insulation, and a powerful magnetic blowout is provided for extinguishing the arc. With each machine 25 ft. of special armored air hose is furnished complete with stop-cock, coupling and nozzle for connection to machines or for cleaning purposes. The general dimensions of this portable air compressor are as follows: Height, 3 ft. 7 in.; width, 3 ft. 11 in., and length, 5 ft. 8 in.

ROLLING STOCK FOR THE WEST JERSEY & SEASHORE DIVISION OF THE PENNSYLVANIA RAILROAD

Information has been given in these columns from time to time regarding the electrification of the West Jersey & Seashore division of the Pennsylvania Railroad. This road will be open for travel on Sept. 10. The type of rolling stock to be used is shown in the accompanying illustration, which is one of eighteen cars built by the J. G. Brill Company from designs furnished by the Pennsylvania Railroad. All of the cars to be used on this division will be motor cars operated at either end and equipped with train control. The cars are of the standard form of Pennsylvania Railroad day coaches, and are equipped for both overhead and third-rail conductors. The seating capacity of each car is 58 passengers. The interiors are finished in mahogany and have the usual features of the Pennsylvania coaches (excepting that the body end windows are omitted), including toilet room, continuous basket racks, balanced sashes and push-over-back seats upholstered in plush. Both ends of the cars are enclosed with vestibules having rounded ends. At the center of the vestibule is a sliding door so arranged that when the door is open it encloses the electric control apparatus, brake and brake valve. The windows on the right side of the center door in front of the control apparatus have double sash, the upper sash being of large dimensions and extending up to the eaves. This sash is arranged to drop low enough to enable the motorman to see the side of his train and get a signal from the conductor, as the door at his right side cannot be opened on account of the closed trap door on which he stands. The sliding door in the vestibule, which alternately covers the center vestibule opening and the control apparatus, is secured in a manner which prevents it from being tampered with by passengers, and the locking apparatus is so placed that the door can be operated in either position. Each platform is provided with hand brakes. On one platform of each car against the body end, back of the motorman's position and opening upon the platform, is a switchboard compartment. The front of this compartment is enclosed with a 3-16-in. steel door set in flush with the car body, and the back has a removable panel. The compartment is lined with fireproof material ¼ in. thick.

INTERIOR OF WEST JERSEY & SEASHORE CAR FOR ELECTRIC SERVICE

ONE OF THE NEW CARS FOR THE WEST JERSEY & SEASHORE DIVISION OF THE PENNSYLVANIA RAILROAD

The bottom framing is the Pennsylvania standard type, consisting of 5-in. x 7¾-in. yellow pine side sills and 7-in. I-beams for center and intermediate sills. The four I-beams extend from end to end of the car. The floor bridging consists of 1¾-in. x 7⅞-in. yellow pine coped into intermediate sills and tennoned into the side sills with blocking between intermediate and center sills and between the center sills. The stringer pieces are ⅞ in. x 7 in., and are laid into the bridging and blocking over the intermediate and center sills and extend the full length of the car body; the bridging is secured transversely by tie rods with ends flush with the side sills. The flooring is double and laid diagonally with an upper layer of maple; both layers are tongued and grooved and have ⅛-in. asbestos fire felt between. The flooring is protected underneath with ¼-in. transite, and in all spaces above the motor truck are placed plates of steel backed with fire belt. The needle beams are composed of 6-in. I-beams

supported at the ends in pockets which are provided with cast-steel truss-rod struts. The body truss rods are of 1¼-in. round iron, upset at the lower end to 1½ ins. The body bolsters are of open steel type and are double at the motor truck end. The body bracing is of W form with short diagonal braces and cripple posts. The letter boards are 9 ins. wide to accommodate the standard Pennsylvania Railroad 7-in. letters.

The general dimensions are as follows: Length over the body end sills, 46 ft. 6 ins.; length over the bumpers, 55 ft. 5½ ins.; from center to center of the needle beams, 10 ft. 6 ins.; width over the side sills, 9 ft. 8¾ ins.; width over the sheathing, 9 ft. 10 ins.; width over the window sills, 10 ft.; height from the under side of center sill to the top of the roof, 9 ft. 8½ ins.; height from the rail to the under side of the side sill with car light, 3 ft. 7 5-16 ins.; height from the rail top to the top of the roof, 13 ft. 3 3-16 ins.; center to center of the windows, 34½ ins.; truck centers, 33 ins.; truck wheel base, 7 ft.

SUMMER CARS FOR VINCENNES, IND.

The street railway system in Vincennes serves a population of about 20,000 people, and the two companies there which operate in conjunction, namely, the Vincennes Citizens' Street Railway Company and the Vincennes Traction & Light Company, having a trackage of about 10 miles. In summer about twenty cars are in daily service. A half-mile extension of the tracks on Taylor Avenue to Columbia Park was completed early this summer and the contract let for the construction of a bridge over Kelso Creek and for the grading of a mile of track to a new natural park site, named Lakewood, purchased by the street railway company. This property, with its 23 acres and beautiful lake, the railway company expects to be a very profitable investment. It is also proposed to build an interurban line to Bruceville and Bicknell, 15 miles distant, and the ground being already surveyed, it is expected to have the road in operation at a very early date. Vincennes promises to be quite an important interurban center, as in addition to the interurban line mentioned three lines connecting Evansville and Princeton, Terre Haute and Sullivan and West Baden are soon to be built. Vincennes has several parks, one of the most attractive being League Park, and an idea of the amount of traffic handled on the lines of this amusement place can be had by a glance at the illustration, which shows the crowds boarding the several cars in waiting after a baseball game.

A LINE OF LOADED OPEN CARS LEAVING THE BASEBALL GROUNDS AT VINCENNES

Within the recent past the Vincennes Citizens' Street Railway Company has added considerably to its rolling stock, having received several lots of closed as well as a number of open cars from the American Car Company, of St. Louis. In addition, another consignment of open cars has now gone forward, the cars measuring 28 ft. 3 ins. over the posts and 35 ft. 11⅜ ins. over the vestibules; the width over the sills is 7 ft. 8 ins., and over the posts at the seat end 8 ft. 2¼ ins.; sweep of the posts, 3⅜ ins.; centers of the posts, 2 ft. 8 ins.; height from the floor to the ceiling, 8 ft. 1 in.; height from the track to the under side of the sills, 2 ft. 5½ ins.; size of the side sills, 4¾ ins. x 7 ins.; size of the center crossings, 3½ ins. x 5⅞ ins.; size of the end sills, 4¾ ins. x 7 ins.; thickness of the corner posts, 3⅝ ins.; thickness of the side posts, 3¾ ins. Each car will seat 65 passengers. Folding steps with entrance guards are provided. The cars have an ash finish; ceilings of decorated three-ply birch. Included among the specialties employed on the cars are angle-iron bumpers, alarm gongs and signal bells, sand boxes, etc. The No. 27-G1 truck, having a wheel base of 4 ft. 6 ins., is used. The diameter of the wheels is 33 ins. and the axle diameter is 4 ins. The weight of the car and the trucks without the motors is 21,000 lbs.

OPEN CAR FOR VINCENNES

A NEW HEADLIGHT DIMMER

The Electric Light Shade Company, of Lima, Ohio, is introducing an attachment which can be placed on any type of headlight for the purpose of dimming the light while on city streets. Laws requiring arc lights to be dimmed are becoming quite prevalent in many cities and towns, and the ordinary method of requiring the motorman to stop his car and place a dimmer or a newspaper over the headlight while passing through the streets of a town is of great annoyance to operators of interurban roads. The device brought out by the company mentioned and designed to obviate this difficulty consists of a simple roll curtain shade, which is attached above the lamp and is operated by a string from the motorman's cab. To dim the lamp the motorman simply pulls the string and attaches it to a hook. Releasing the cord causes the dimmer to roll up out of place. The roller may be placed either inside or outside of the lamp, but in the former position is protected against rain and snow.

LEGAL DEPARTMENT*

CHARTERS, ORDINANCES, FRANCHISES, ETC.

ALABAMA.—Pleading—Conclusions—Eminent Domain—Remedies of Property Owners—Appeal—Failure to Urge Objections—Waiver—Remedies of Property Owners—Street Railroads—Rights in Streets—Damages—Tenancy in Common—Action by Tenants—Action—Evidence—Trial—Failure to Request Instructions—Computation of Damages—Parties—Striking Out—Effect.

1. Const., Sec. 227, makes a corporation constructing any public utility along a street under a franchise permitting such construction liable to abutting property owners for actual damages. Held that a complaint in an action against a corporation which had constructed a railroad embankment along a street under a franchise from the city, and which merely alleged that plaintiff's lot was "damaged on account of such construction," was demurrable as containing a mere conclusion.

2. Const., Sec. 227, makes a corporation constructing any public utility along a street under franchise permitting such construction liable to abutting property owners for actual damages to their property. In an action against a corporation which had constructed a railroad embankment in a street under a franchise, the complaint alleged the plaintiffs claimed damages for that, while they were the owners of certain lots abutting on the street, defendant under a franchise from the city constructed an embankment along the street and was operating thereon a line of railroad, and that by reason of the embankment the water backed upon and stood upon plaintiffs' lots. Defendant demurred on the ground that the averments of the complaint were vague, indefinite and uncertain; that it did not appear therefrom how or in what manner plaintiffs' property was damaged; that the statements of the complaint were mere conclusions; that no facts were alleged which showed or tended to show that the property was damaged; and that the complaint did not state a cause of action, in that it did not allege any duty owing by defendant to plaintiffs, nor allege a violation of any duty so owing. Held that the demurrers were properly overruled.

3. Grounds of error not insisted upon in the brief of counsel on appeal are waived.

4. Const., Sec. 227, makes a corporation constructing any public utility along a street under a franchise permitting such construction liable to abutting property owners for actual damages. Held that the measure of damages is the difference between the market value of an abutting lot before and after the construction of the utility.

5. In an action by five or seven tenants in common for damages to the land from the construction of a railroad embankment in a street on which the land abutted, the measure of recovery by the five was five-sevenths of the total damage.

6. Const., Sec. 227, makes a corporation constructing any public utility along a street under a franchise permitting such construction liable to abutting property owners for actual damages. Held that in an action by the owner of a lot abutting on a street in which a railroad embankment had been constructed under a franchise, it was error to admit evidence as to what amount of material would be required to fill in plaintiff's lot to bring it to a level with the car rail on the embankment.

7. In an action by the minor owners of a lot abutting on a street to recover damages for the construction of a railroad embankment in the street, it was not error for the court to instruct that limitations had no application to the plaintiffs during their minority, and that it was immaterial so far as they were concerned when the embankment was constructed, without stating to the jury that the right of recovery was confined to damage accruing during and after the time of construction alleged in the complaint, where defendant requested no explanatory charge.

8. Under Const., Sec. 227, making a corporation constructing any public utility along a street under a franchise permitting such construction liable to abutting property owners for actual damages, in an action by the owner of property abutting on a street to recover damages for the construction of a railroad embankment in a street under a franchise, it was necessary for plaintiff to show that the embankment was constructed under a franchise.

9. Code 1896, Sec. 1718, in relation to eminent domain, provides that the amount of compensation to which an owner is entitled must not be reduced because of accidental benefits. Const., Sec. 227, makes a corporation constructing any public utility along a street under a franchise permitting such construction liable to abutting property owners for actual damages, the jury may not consider whether the construction of the utility has enhanced or decreased the value of plaintiff's property.

10. Code 1896, Sec. 3331, authorizing the amendment of a complaint by striking out parties plaintiff, where all the plaintiffs who originally sued for damages to their lot owing to the construction of a railroad embankment in a street on which the lot abutted owned a joint interest in the property, and some of the plaintiffs were stricken from the complaint, it did not entitle defendant to a verdict as against the remaining plaintiffs.—(Birmingham Ry., Light & Power Co. vs. Oden et al., 41 S. Rep., 129.)

ILLINOIS.—Jury—Peremptory Challenges—Number—Appeal—Harmless Error—Challenges to Jurors—Eminent Domain—Condemnation for Right of Way—Damages—Evidence—Damages to Land Not Taken—Value of Land—Use for Illegal Purpose—Instructions—Rule of Damages.

1. In condemnation proceeding against the owner of the fee and his tenant, defendants constituted only one party, and were entitled to three peremptory challenges; the petitioner being entitled to the same number.

2. In a condemnation proceeding against the owner of the fee and his tenant, error in allowing both parties six peremptory challenges, instead of three, to which they were entitled, was harmless to defendants.

3. In a proceeding to condemn land for the purpose of widening a right of way for a third track, in which petitioner introduced evidence that it contemplated moving a station from its location, adjoining property of defendant not sought to be condemned, but situated adjacent to that to which the proceedings related, and that it intended to operate an express train on the third track at a speed of 40 m. p. h., evidence to show what damages to the property not taken would result from the removal of the station and the operation of trains at the speed named was immaterial, since the petitioner had a right, irrespective of the condemnation proceedings, to remove the station and to operate trains at the rate of 40 m. p. h. upon its existing tracks.

4. In a proceeding to condemn a tract of land which would necessitate the removal of an annex to a building on land not sought to be condemned, questions as to what effect, in the opinion of the witness, the taking away of the annex would have upon the building remaining, were improper, and should have been framed so as to call for an answer as to what would be the effect upon the fair cash market value of the land not taken.

5. In a proceeding to condemn land on which was situated a leased building used by the tenant as a saloon and dance hall, evidence that the business was so conducted as to violate the ordinances of the city and the laws of the State was immaterial.

6. In a proceeding to condemn a portion of a tract of land, an instruction that if the jury believed that the land sought to be taken was worth more as part of the whole tract than it would be worth if separately and distinctly owned, and not connected with the remainder of the tract, and further believed that the value of the part sought to be taken, as used in connection with the whole tract, was all there was of value or damage to the whole tract, they should allow for the part sought to be taken its fair cash market value as part of the whole tract, and no damages to the remainder by reason of the taking of the part sought to be condemned was misleading.

7. In a proceeding to condemn a portion of a tract of land, the owners are entitled to the fair cash value of the property taken, estimating its value with the adjoining realty owned by them, or estimating its value separately if its value is greater separately, and, if the realty not taken is not depreciated in value by reason of the taking of the remainder, then no damages to be allowed for the part not taken, but if the taking of the part condemned causes a depreciation in the value of the part not taken, or if the purpose for which the part taken is to be used causes such depreciation, the owner is entitled to compensation therefor.

8. In a proceeding to condemn a portion of a tract of land on which was located a leased building claimed to be used by the lessee in violation of the laws of the State and ordinances of the city, an instruction that no public official of the city had a right to authorize the violation of any of its ordinances or the laws of the State, and that neither the owner nor lessee could be excused for such violation because it was countenanced by a public official, was improper.—(Freiberg et al. vs. South Side Elevated R. Co., 77 N. E. Rep., 920.)

ILLINOIS.—Eminent Domain—Condemnation Proceedings—Attorney's Fees—Amount—Value of Services—Attorney and Client—Authority to Employ Assistant Counsel.

1. Under Laws 1897, p. 218, providing that in the exercise of the

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right of eminent domain, the court shall upon application of defendants make such order for the payment by the petitioner of all costs, expenses and reasonable attorney's fees of the defendant as shall be just, the court can allow only the fees for which defendant is liable, and hence is restricted to the fee provided by the contract between defendant and his attorney, or, in case there is no express agreement, the reasonable value of the attorney's services.

2. In a condemnation proceeding, an allowance of $800 for defendants attorney's fees held against the weight of the evidence.

3. Unless a client authorizes his attorney to employ assistant counsel, he is not liable for the fees of such assistant counsel.—(Chicago & S. Traction Co. vs. Flaherty et al., 78 N. E. Rep., 29.)

MAINE.—Street Railroads—Change of Location—Determination of Railroad Commissioners—Operation—Certificate of Safety—Eminent Domain—Street Railways—Additional Servitude—Compensation.

1. The determination of the Railroad Commissioners in regard to the change of location of a street railroad is final. The omission of the clerk of the Railroad Commissioners, within five days after the filing of the certificate of their decision, to give notice of such determination to all parties of record, does not deprive the railroad corporation of its right to construct and operate its road, or make that a public nuisance which would oherwise be a lawful use of the street.

2. The operation of a street railroad for other purposes than street traffic, before the Railroad Commissioners have granted a certificate of its safety for public travel, is not forbidden by Rev. St., c. 53, Sec. 20.

3. The use of a street by a street railroad is a public servitude imposing no additional burden upon the abutter. The damages paid, when the street was built, were for all time and for all public uses fairly contemplated at the time the land was taken.

Such inconveniences as are inseparable from the use by the public of a public way cannot be made the foundation of an action for damages.—(Parsons vs. Waterville & O. St. Ry., 63 Atl. Rep., 728.)

MASSACHUSETTS.—Street Railroads—Rights in Streets—Repair—Liability—Estoppel—Order—Construction — Statutes—Construction—Obligation to Pave and Maintain—Power of Aldermen—Repeal—Effect.

1. That a street railway company complied with an order requiring it to lay and maintain paving within certain streets according to certain specifications did not estop it to thereafter contest the legality of the order.

2. An order required a street railway company to lay and maintain paving in certain streets and to assume the expense of paving where the streets were unpaved, either for the full width of two streets and between the track, or between the tracks and for a limited distance outside the rails as to the remaining streets, and also to repave with the same material the streets already paved, the surface of which would have to be removed in the construction of the road. Held that the general provision requiring the company to lay and maintain paving was not limited to paving only, and did not exclude the cost of subsequent maintenance.

3. Pub. St., c. 113, Sec. 7, relating to street railway locations authorized the Board of Aldermen and Selectmen of towns to grant original locations to street railway companies subject to such "restrictions" as they deemed the public interest required. Held that the word "restrictions," as so used, was a legal equivalent of "conditions," and therefore authorized the board to impose limitations on the full and unqualified enjoyment of the right to use the streets so granted.

4. Pub. St., c. 113, Sec. 7, provides that the Board of Aldermen of a city or the Selectmen of a town may grant an order for the location of a street railway "under such restrictions as they deem the interests of the public may require," and section 32 provides that every street railway shall keep in repair the paving, upper planking, or other surface material of the portions of the streets occupied by its tracks, and in addition a space 18 ins. on each side of the portion so occupied, etc. Held that section 7 should be treated as supplementary to section 32, and as conferring jurisdiction on the Board of Aldermen to impose a condition on the grant of a street railway location that the railway company shall pave and maintain the street to an extent greater than that prescribed in section 32.

5. Pub. St. 1898, p. 748, c. 578, Sec. 26, repealing chapter 113, section 7, with reference to the granting of street railway locations by cities, declared, (section 11, p. 742) that street railway companies shall remain subject to all legal obligations imposed in their original grants, and reference was again made in section 13 (page 743), which ratified and confirmed all previous locations which were given validity as if granted under the repealing act. Held that the repeal of section 7 did not terminate the obligation of a company to pave and maintain streets imposed by a location grant previously made under the repealed sections.—(Blodgett et al. vs. Worcester Consol. St. Ry. Co., 78 N. E. Rep., 222.)

NEW JERSEY.—Eminent Domain—Condemnation of Land-Trolley Company.

A trolley company, holding under lease a strip of land 13 ft. in width, upon which it had built and operated a street railway, sought to condemn an additional strip of land of less width than 47 ft. lying alongside of the 13-ft. strip, the new strip to be used in connection with the already existing road. Held that there existed no power to condemn the additional ribbon of land under the provisions of section 13 of the act of 1893, as this land was not to be used either as an extension of the line of an existing railroad or a new line not exceeding 60 ft. in width.—(Metlar vs. Middlesex & S. Traction Co., 63 Atl. Rep., 497.)

NEW JERSEY.—Taxation—Franchises—Constitutionality of Statute—Nature of Tax—Property Subject—Liability to Other Tax.

1. The act of 1900 for the taxation of franchises of persons and corporations using or occupying public streets (P. L. 1900, p. 502) is constitutional.

2. The franchise tax imposed by the act of 1900 (P. L. 1900, p. 502) is in the nature of a license tax, and not a tax upon property.

3. The franchises to use or occupy public streets which are subject to a franchise tax under the act of 1900 (P. L., 1900, p. 502) are not subject to a property tax under the general tax act of 1903 (P. L. 1903, p. 394).—(North Jersey St. Ry. Co. vs. Mayor, etc., of Jersey City et al., 63 Atl. Rep., 833.)

NEW YORK.—Carriers—Passengers—Transfers—Penalty—Motive.

A street car passenger, desiring to make a trip to a point within the city, located on a car line controlled by the same company, demanded and was refused a transfer to the intersecting line, to which she was entitled under Railroad Law, Laws 1890, p. 1114, c. 565, Sec. 104, as amended by Laws 1892, p. 1406, c. 676, providing also, to the end that the public convenience might be promoted, a forfeiture of $50 to one aggrieved by a refusal of such transfer. The passenger continued her journey on the intersecting line, paying the additional fare and making purchases at her destination. Held that the statute being punitive, rather than compensatory, it was immaterial to the company's liability for the penalty that the passenger knew she would not receive the transfer, or that one of the objects of the trip was to recover such penalty, or that she had many other similar suits pending.—(Fitzmartin vs. New York City Ry. Co., 99 N. Y. Sup., 765.)

NEW YORK.—Carriers—Regulation—Street Railroads—Refusal of Transfers—Penalty.

A street railway company is not liable for refusal of a transfer where a passenger, though desiring to go south on Avenue A, merely asks for an Avenue A transfer, and is given one good only on a northbound car.—(Gasper vs. New York City Ry. Co., 99 N. Y. Sup., 904.)

NEW YORK.—Eminent Domain—Measure of Compensation.

Where a street was taken for an elevated railroad, it was proper to award to abutting owners, not owners of the street, an amount equal to the difference between the value of the property before and after the taking, less the consequential damages due to the annoyance caused by noise, vibration, unsightliness of structure, and all elements other than the value of easements of light, air and access.—(In re Brooklyn Union Elevated Ry. Co., 99 N. Y. Sup., 222.)

NEW YORK.—Street Railroads—Delay in Construction—Forfeiture of Charter—Certificates of Extension—Statutes—Validity—Law Authorizing Construction of Street Railroad—Local Acts.

1. Railroad Law, Laws 1890, p. 1084, c. 565, Sec. 5, provides that if any domestic railroad corporation shall not, within five years after its certificate of incorporation is filed, begin the construction of its road its corporate existence and powers shall cease. Section 99 (page 1112), which applies only to street railroads, declares that in case any such corporation shall not commence the construction of its road, or of any extension or branch thereof, within one year after the consent of the local authorities and property owners, or the required determination of the General Term shall have been given or renewed, its rights and franchises in respect to such railroad, extension, or branch may be forfeited. Held that section 99 does not provide the only method

by which the charter of a street railroad company may be forfeited for delay in constructing its road, and hence does not prevent section 5, which is self-executing, from applying to street railroads, so as to work a forfeiture without any proceedings for that purpose, if such a corporation neglects for a period of five years after its incorporation to commence the construction of its road.

2. Railroad Law, Laws 1890, p. 1084, v. 565, Sec. 5, providing that if any corporation shall not, within five years after its certificate of incorporation is filed, begin the construction of its road and expend thereon 10 per cent of the amount of its capital, or shall not finish its road and put it in operation in ten years from the filing of such certificate, its corporate existence and powers shall cease, applies also to extensions constructed pursuant to certificates of extension, and the rights under such a certificate of extension are lost if work is not begun within five years from the date of the certificate.

3. Railroad Law, Laws 1890, p. 1084, c. 565, Sec. 5, provides that if any railroad corporation shall not, within five years after its certificate of incorporation is filed, begin the construction of its road, its corporate existence and powers shall cease. Laws 1901, p. 1229, c. 494, provides that the consent by the local authorities of any city previously acquired by any street railroad corporation should be deemed to be in full force and effect and continue until December 31, 1903. Laws of 1901, p. 1261. c. 508, declares that section 5 of the railroad law shall not apply to any street railroad company incorporated prior to July 1, 1895, which had obtained or become the owner of the consents of the local authorities of any city of the first or second class. Held that the statutes of 1901, so far as they relate to railroad companies whose charter rights had been forfeited by inaction prior to the enactment by the statutes, are in conflict with Const. art. 3, Sec. 18, providing that the Legislature shall not pass any private or local bill granting the right to lay railroad tracks, nor authorize the construction or operation of street railroads, except upon the condition that the consent of the owners of one-half of the value of the property abutting on the roads and the consent of the local authorities be first obtained.—(In re Brooklyn, Q. C. & S. R. Co., 77 N. E. Rep., 994.)

NEW YORK.—Carriers—Regulation—Street Railroads—Refusal of Transfer—Penalty.

Defendant street railway company operated a line of cars which ran only on 125th street, an east and west street. It also operated a line the cars of which went north on Third avenue to 125th street, thence west to A avenue, thence north on A avenue. It also had a line running south on A avenue from 125th street. To prevent unlimited riding for one fare the company had a rule that from the north-bound cars of the Third avenue line only green transfers for a ride north on A avenue should be issued, while from the cars of the 125th street line a white transfer, good in either direction on A avenue should be issued. Plaintiff boarded a Third avenue car while it was on 125th street going west, and, asking for a transfer to go south on A avenue, received a green transfer, which the conductor on the south-bound A avenue car refused to accept. Held that, in the absence of proof that the public had been given notice of the rule as to transfers, defendant was liable for the penalty for refusing a transfer.—(Gasper v. New York City Ry. Co., 99 N. Y. Sup., 902.)

NEW YORK.—Carriers—Refusal of Transfer—Rules of Company.

Under Laws 1890, p. 1096, c. 565, Sec. 39, providing that any railroad corporation which shall ask or receive more than the lawful rate of fare, unless through inadvertence or mistake not amounting to gross negligence, shall forfeit $50, and section 104, as amended by Laws 1892, p. 1406, c. 676, providing that a street surface railroad corporation using several lines in a city shall on demand and without extra charge give to each passenger paying a single fare a transfer, entitling him to one continuous trip to any point on any such line, and for refusal to do so shall forfeit $50, a street railroad company is liable for the penalty, though it has made a rule that the transfer be demanded when the fare is paid, and the conductor refused one because it was not demanded till some time thereafter.—(Levine v. Nassau Electric R. Co., 99 N. Y. Sup., 422.)

PENNSYLVANIA.—Street Railroads—Use of Street—Eminent Domain—Right to Compensation.

1. A street railway company obtained from a borough the right to use a certain street, the borough reserving the right to grant the "common use" of such street to another company in common with the first company. The street was broad enough to accommodate two parallel tracks. Held that the borough could not require a later company, having permission to use the same street, to so lay its tracks as to straddle the tracks of the other company.

2. Where a street railway company is granted permission to lay its tracks in a street, allowing a later corporation to lay a part of its tracks on the tracks of a first company is an unconstitutional taking of the property of the first company.—(Commonwealth ex rel. Philadelphia, Bristol & Trenton St. Ry. Co. v. Bond et al., 63 Atl. Rep., 741.)

PENNSYLVANIA.—Street Railroads—Relaying Tracks—Acquiescence in Line—Trial—Findings—Conformity to Pleadings—Double Track—Turnouts.

1. Where a street railway company, in laying its track, failed to follow the exact line established by the borough, but the borough acquiesced in it for 10 years, it constitutes a ratification, and the borough cannot object where the railroad company follows the same line in relaying its tracks.

2. A borough, in a bill against a street railway company, charged that it was building a double-track railway to the irreparable damage of the borough, and the answer admitted the construction of the double track, but denied irreparable damage. Held that under the pleadings the court cannot find as a fact that the alleged double track was in fact a turnout.

3. A turnout in connection with a street car line is a short line of track having connection by means of switches with the main track, and an additional track in a borough cannot be considered a turnout, where, taken in connection with the original track and with a double-track railway with which the two tracks connected at the limits of the borough, it constitutes an unbroken double-track line.—(Borough of Bridgewater v. Beaver Valley Traction Co., 63 Atl. Rep., 796.)

VIRGINIA.—Writ of Error—Instructions—Review—Record—Evidence—Eminent Domain—Assessment of Compensation—Instructions to Commissioners—Compensation for Property Taken—Value—Writ of Error—Record—Review of Instructions.

1. Where the refusal of instructions is sought to be reviewed on a writ of error, the evidence should be made a part of the record by bill of exceptions.

2. Where, prior to proceedings by a street railway company to condemn a right of way over certain land, defendants had recovered the land from the railroad company in ejectment, an instruction that, in considering what was a just compensation, the commissioners must consider to what uses it might be put by the owners, and that if they had dedicated the strip to the public while they owned the fee, such ownership was subject to the rights of the public to freely travel on and over the strip, was properly refused as erroneously authorizing the commissioners to consider defendants' rights in the land, which had been disposed of by the court both in the order appointing them and directing them to consider what would be a just compensation for the fee simple title to the land and in the ejectment proceeding.

3. The instruction was also properly refused as uncertain and misleading, in that it declared that if the owners had dedicated the land to the public in "whole or in part" the public was entitled to travel over all of it.

4. A strip of land sought to be condemned had been occupied by a railway continuously for many years, during which time the strip had been repurchased by defendants for default in the payment of a debt secured by a deed of trust resting on the land. Held that by defendants' purchase under the deed of trust, they acquired the property in its then condition, and hence an instruction limiting their recovery to a sum based on the value of the land when the railway was constructed was properly refused.

5. Where instructions copied into the record were nowhere made a part of it by any bill of exceptions, they could not be reviewed on writ of error.—(Newport News & O. P. Ry. & Electric Co. v. Lake et al., 54 S. E. Rep., 328.)

LIABILITY FOR NEGLIGENCE

ARKANSAS.—Street Railways—Operation—Collision with Animals—Contributory Negligence of Owner—Evidence—Res Gestæ—Killing Animals—Liability—Damages to Property—Statutes—Application to Street Railways—Instructions—Trial—Applicability to Evidence—Comment on Amount Involved.

1. In an action against a street railway for the killing of a hog, the burden is on plaintiff to show that the hog was killed through the negligence of defendant.

2. Where, in an action against a street railway for the killing of a hog, it appeared that the hog was outside of the stock limit, it was not contributory negligence to allow it to run at large.

3. In an action against a street railway for the killing of a hog, it was proper to admit evidence that the motorman remarked at the time "that the hog jumped on the track right in front of the car."

4. In an action against a street railway company for the killing of a hog, plaintiff was not entitled to recover in the absence of evidence that the hog went on the track in front of the motorman in time for him to have stopped the car before striking it, had he seen it and used all the means in his power to that end.

5. Kirby's Dig. Sec. 6773, making railroads responsible for all damages to property caused by the running of trains, is not applicable to street railways.

6. In an action against a street railway for the killing of a hog, defendant requested the court to charge that, in order to find for plaintiff, the jury must find that the hog went on the track and was seen by the motorman when the car was a sufficient distance away to have permitted him, by the exercise of ordinary care and prudence, to stop the car before striking the hog, and that, if the motorman exercised ordinary and reasonable care to avoid the accident after he discovered the danger of the hog and was unable to do so, the jury should find for defendant. Held, that the instruction was properly refused.

7. An instruction that, in order to find for plaintiff, the jury must find that the hog went upon the track and was seen by the motorman of the car, or could have been seen by him in the use of ordinary care in operating the car, when the car was a sufficient distance away to have permitted him, by the exercise of ordinary care, to stop the car before striking the hog, there being no evidence tending to show that the motorman could have seen the hog when a sufficient distance away to have permitted him to stop the car, was erroneous.

8. In an action against a street railway for the killing of a hog, it was error, after submitting the case to the jury, to instruct them that the amount was small, and that it cost the county more to try the case than was involved to either of the litigants, and that it was the desire of the court that the jury decide the case if they could do so without giving up their honest convictions.—(Little Rock Ry. & Electric Co. vs. Newman, 92 S. W. Rep., 864.)

CALIFORNIA.—Appeal—Conclusiveness of Verdict—Carriers—Injury to Passengers—Evidence—Rebuttal—Presumption of Negligence—Burden of Proof—Preponderance of Evidence—New Trial—Newly Discovered Evidence.

1. Verdict of the jury, supported by conflicting evidence, will not be disturbed on appeal.

2. Where, in an action against a street railway company for injuries alleged to have resulted from the emission of flashes of flame from the electrical apparatus of the car on which plaintiff was a passenger, evidence was admitted as to the extent of the flashes and the resulting explosions, on plaintiff's theory that he was blown from the car by the explosions, or that they were of such magnitude he was justified in jumping from the car to escape, further evidence on behalf of plaintiff as to extent of the flashes and explosions was not admissible in rebuttal.

3. In an action against a carrier for injuries to a passenger, which were received under circumstances giving rise to a presumption of negligence, it is nevertheless proper to charge that the burden of proof is upon plaintiff.

4. In an action against a carrier for injuries to a passenger, received under circumstances giving rise to a presumption of negligence, defendant is entitled to a verdict if it produces sufficient evidence to balance the presumption without overcoming it by the preponderance of the evidence.

5. Newly discovered evidence which is merely cumulative is not sufficient ground for new trial.—(Patterson vs. San Francisco & S. M. Electric Ry. Co., 81 Pac. Rep., 531.)

COLORADO.—Appeal — Discretion of Court — New Trial — Harmless Error—Admission of Evidence—Record—Presumption—Negligence—Places and Things Attractive to Children—Duty of Owner—Contributory Negligence of Children—Question for Jury.

1. The determination of the court as to whether a new trial shall be granted for statements of counsel in argument will not be disturbed, except for clear abuse of discretion.

2. Permitting an expert, called by plaintiff in an action for injury to a child playing in a trolley car left by defendant in the street, to describe the different kinds of mechanical devices used on defendant's several cars, is harmless.

3. Where the abstract of record does not purport to contain the entire charge, it will be presumed that it substantially embraced instructions requested and refused.

4. On the question of liability of a street railway company for injury to children from playing about cars left in the street unguarded, the legality or illegality of the occupation of the street by the company is immaterial.

5. Where children are attracted by and go on street cars left stored on a street by a railway company, it is the duty of the company to take reasonable precaution to prevent the children going thereon, or to protect from injury such as may be attracted thereto.

6. Infants of tender years are not held to the strict rule of contributory negligence; but the care and caution required of them is according to their maturity and capacity only.

7. Whether a child being 13 years old was sui juris, and therefore to be held to the strict rule of contributory negligence, is a question for the jury.—(Denver City Tramway Co. vs. Nicholas, 84 Pac. Rep., 813.)

ILLINOIS.—Appeal — Findings — Conclusiveness — Evidence—Res Gestæ—Declarations—Admissibility—Street Railways—Collisions—Injuries—Evidence—Trial—Misconduct of Counsel—Action of Court—Instructions—Applicability to Pleadings—Construction of Charge as a Whole.

1. The judgment of the Appellate Court is conclusive on the weight of the evidence or the credibility of the witnesses.

2. Where a collision between a street car and a fire engine occurred almost immediately after a third person attempted to warn the motorman of the approach of the engine, the reply of the motorman to the warning was sufficiently connected with the thing done to make it competent evidence.

3. Where, in an action against a street railway company for the death of a fireman in a collision between a car and a fire engine on its way to a fire, it was shown that the motorman and the decedent were familiar with the rule giving the fire department the right of way, the rule was admissible as bearing on the question of contributory negligence of decedent in permitting the engine to approach the crossing at which the collision occurred at the speed he did.

4. Plaintiff's counsel in his opening statement started to state to the jury certain facts which were improper. The counsel of the adverse party interrupted him by an objection, which was sustained by the court, and the jury were immediately instructed to disregard such statement. Held, that the misconduct of counsel was not a ground for a reversal.

5. An instruction in an action for negligent death, authorizing a verdict for plaintiff on the jury finding that defendant was negligent, "and that such negligence caused the injury to the plaintiff's intestate complained of," in specified counts of the amended declaration, or any one of them, and plaintiff's intestate was at the time in the exercise of ordinary care, is not open to the objection that it does not restrict the negligence for which plaintiff can recover to that charged in the enumerated counts of the declaration, where the court charged that before there can be a recovery defendant must have been guilty of the negligence charged in some count of the declaration submitted, and that the instructions must be considered in one connected series.—(Chicago City Ry. Co vs. McDonough, 77 N. W. Rep., 577.)

LOUISIANA.—Street Railways—Injury to Person on Track—Evidence—Negligence.

1. The decedent was at a place where he had a right to be, on the track on his way to board a street car.

2. The car of the defendant company, the appliances, and the road were in good order.

3. The car was running at the usual rate of speed.

4. The decedent and his companion were not standing on or dangerously near the track on which the car which collided with decedent was coming up.

5. The decedent suddenly turned and left the place where he was standing, and ran diagonally in the direction of the coming car, and struck the dashboard and was killed. When he crossed over to the advancing car with which he collided, he was about 6 ft. from the coming car.

6. The weight of the evidence sustains the view that it was too late after the decedent came on the track to stop the car and save his life.

7. The threatened danger alleged grew out of a misapprehension. The companion remained where the two were standing before the decedent turned and walked back, and was not hurt.

8. The testimony shows that the accident was sudden. The

companion of the decedent said, with reference to the latter, "He just turned around for a minute—a second."

The court finds it impossible, in view of the facts, to hold that the motoneer is responsible for the death.—(Greve vs. New Orleans & C. R. Light & Power Co., 38 S. Rep., 698.)

LOUISIANA.—Carriers—Injury to Passengers—Street Railways—Neglect of Conductors—Arrest of Passenger—Liability of Carrier.

1. The defendant railway company, by its act of incorporation, came under certain legal obligations for the safety and protection of the public, and particularly of its passengers. It had for that purpose to act through its employees, for whose acts it was responsible. The conductor of a street car represents the street railway company. The company cannot free itself from the obligations referred to by failing to give its conductors full and specific instructions or by restricting the limit and extent of their authority, so as to disable them from properly performing duties which it is inherently necessary and essential they should have to carry out to the extent of legal requirements of the functions of the positions in which they are placed. It cannot, by merely enjoining upon the conductors to perform their duties cautiously, prudently, and well, break the effect of their failure to comply with these instructions; nor can it, by throwing the instructions into the form of prohibitory orders, alter the legal scope of their powers, duties, and authority. These are matters which it cannot lessen and make to fall below the limit of authority affixed by the law to the positions themselves.

2. The conductor of a street car invited a police officer to come upon his car, saying there was a pickpocket upon it. After he entered the conductor pointed out to him one of the passengers on the car as being such. The policeman arrested the passenger, took him off the car short of his destination, marched him under arrest through a crowded street, and sent him in a patrol wagon to a police station, where he was detained several hours and then released without any charge having been preferred against him. He was shown to be a man of good character and position.

3. The conductor did not himself make the arrest, but it was through his instrumentality that the passenger was arrested and ejected from the car and taken to the station. The conduct and course pursued by the policeman was the direct and natural consequence of that of the conductor. Under the Civil Code, he who causes another person to do an unlawful act, or assists or encourages the commission of it, is answerable in solido with that person for the damage occasioned by that act.—(Schmidt vs. New Orleans Rys. Co., 40 South Rep., 714.)

MASSACHUSETTS.—Street Railways—Collision with Team—Negligence—Evidence—Contributory Negligence—Trial—Instructions.

1. Evidence in an action for collision of a trolley car with a large covered wagon, while crossing the tracks diagonally and going in the same general direction as the car, held sufficient to authorize a finding of negligence.

2. Evidence in an action for collision of a trolley car with a large covered wagon filled with furniture, while plaintiff was driving it diagonally across the tracks going in the same general direction as the car, held sufficient to authorize a finding that plaintiff was in the exercise of due care.

3. The driver of a covered wagon, who cannot see behind it because of its size and its being loaded, has the right to assume, in attempting to diagonally cross a street railway, that the motorman of any car coming from behind will do his duty by giving him time to cross.

4. The court need not give a requested instruction on an isolated part of the evidence, as to its bearing on the question of plaintiff's contributory negligence.—(Williamson vs. Old Colony St. Ry. Co., 77 N. E. Rep, 655.)

MASSACHUSETTS.—Evidence—Expression of Present Pain—Trial—Cumulative Evidence—Declaration of Deceased—Carriers—Injuries to Passenger—Contributory Negligence—Negligence—Obligation to Notify Passenger of Signal to Start.

1. In an action against a street railway for injuries to intestate, evidence that after the injury, deceased, in riding one day in her own carriage "spoke about how hard it rode," and said that "it seemed as though her carriage never rode so hard before," was admissible as an expression of then present pain or weakness.

2. Under St. 1898, p. 522, c. 535, now Rev. Laws, c. 175, sec. 66, providing that a declaration of a deceased person shall not be inadmissible in evidence as hearsay, if the court finds that it was made in good faith before the commencement of the action and upon the personal knowledge of the declarant, the fact that in an action against a street railway for injuries to plaintiff's intestate while a passenger on defendant's car, a daughter of deceased had testified to a conversation with her mother in which the latter described the accident, did not preclude another daughter from testifying to a similar conversation with deceased.

3. In an action against a street railway for injuries to plaintiff's intestate caused by the sudden starting of defendant's car with a jerk, thereby throwing intestate down, the fact that after deceased entered the car she walked up the aisle 5 or 6 ft. before the car started, did not preclude the jury from finding that in proceeding toward the front of the car decedent was exercising ordinary care, even if she did pass an empty seat which she should have taken.

4. On the issue as to the negligence of a street railway in starting one of its cars suddenly, thereby injuring a passenger who had entered the car, the question of the negligence of defendant's conductor in giving the signal to start was to be considered with reference to his duty to such passenger, and not to another passenger still on the steps of the car.

5. Where plaintiff's intestate, a strong, healthy woman between 58 and 60 years of age, showing no sign of physical or mental infirmity, had entered defendant's street car, and was proceeding to her seat in the usual way, defendant's conductor was under no obligation to wait until she had become seated before giving the signal to start.

6. Nor was defendant's conductor bound to notify plaintiff's intestate that he was about to give the signal to start the car.—(Weeks vs. Boston Elevated Ry. Co., 77 N. E. Rep.,653.)

MICHIGAN.—Street Railroads—Operation—Rights in Street—Injuries to Person on Track—Contributory Negligence—Question for Jury.

A street railroad has the right of way, and under ordinary circumstances it is the duty of other travelers using the tracks to yield them to the cars upon their approach.

One who drove upon a street railroad track ahead of a car at a time when, if he had looked, he would have seen that he could not get across in time to escape the car, and who knew that the car was behind him and traveling at a high rate of speed, was guilty of contributory negligence.

In an action for injuries to plaintiff in a collision between his vehicle and a street car. Held that the question whether the motorman could have avoided the collision by the exercise of reasonable care after dissolving plaintiff's negligence was for the jury.—(Daniels vs. Bay City Traction & Electric Co., 107 N. W. Rep., 94.)

MISSISSIPPI.—Street Railways—Negligence—Injuries to Passengers Standing on Running Board—Contact with Trolley Posts—Distance from Track—Contributory Negligence—Risks Assumed—Obvious Dangers—Guard Rail—Duty to Maintain — Evidence — Presumption — Question of Law—Questions for Jury.

1. Where, in an action for injuries, plaintiff's evidence and all just inferences to be drawn therefrom, show that his own negligence contributed to produce the injury, it is the duty of the court, though defendant introduces no proof to support a plea of contributory negligence, to instruct the jury, as a matter of law, that plaintiff cannot recover.

2. When the facts are not disputed, and the inferences or conclusion resulting therefrom are indisputable, the question of contributory negligence is one of law for the court.

3. In an action against a street railway for injuries to a passenger through being struck, while standing on the running board of defendant's car, by a trolley post, evidence held to show contributory negligence on plaintiff's part.

4. A defendant need not introduce testimony to support a plea which is fully sustained by plaintiff's evidence.

5. No proof is required to establish the proposition that it is more dangerous to be on the running board of a street car than to be on the seat, or even on the platform.

6. Where a passenger on a street car, inside which there is plenty of room, voluntarily leaves his seat and stands on the car platform, and, while the car is running rapidly, attempts to return to his seat by way of the running board of the car, on a side where he knows there are trolley posts, instead of going down the aisle, he thereby assumes all the risks arising from the position taken by him.

7. In an action against a street railway for injuries to a passenger, while standing on the running board of defendant's car, through being struck by a trolley post at the side of the track, that the pole was slightly nearer the track than two other posts

just on each side of it, does not tend to prove that the post in question was dangerously near the track.

8. Nor does it show gross negligence on defendant's part, the other posts appearing to have been further from the track than was necessary.

9. In the absence of evidence, it would not be presumed that the post, which was 33 ins. from the nearest rail of a street car track, was dangerously near or at all too close to the track.

10. The mere fact that the accident occurred did not even tend to prove that the post was too near the track.

11. The fact that the guard rail or bar which plaintiff knew was ordinarily kept down along the side of the car nearest the posts, as protection against the same, was up, did not relieve him of contributory negligence in exposing himself to an obvious danger.

12. A street railway is not negligent in failing to maintain a guard rail on the side of a car nearest the trolley posts for the protection of passengers where the posts are not dangerously near the track, and the danger therefrom is obvious.

13. Carriers are not bound to so restrain the liberty of their passengers that the latter can by no act of their own put themselves in unnecessary danger.—Bridges vs. Jackson Electric Ry., Light & Power Co., 38 S. Rep., 788.)

MISSOURI.—Carriers—Injury to Passenger—Pleading—Petition —Sufficiency—Amendment—Continuance—Amending Pleading—Abuse of Discretion—Damages—Personal Injuries—Amount.

1. In an action against a street railway for injuries, a petition alleging that defendant's car was stopped to receive plaintiff as a passenger, and that while she was getting on, and when by ordinary care defendant's employees could have seen the child in plaintiff's arms, and before plaintiff had reasonable time to get in a position of safety in such car, such employees "caused the said car to suddenly start forward," in consequence whereof she was injured, sufficiently charged a cause of action to be amended by the insertion of the word "negligently."

2. Under Rev. St. 1899, Sec. 688, providing that when a party shall amend any pleading, and the court shall be satisfied by affidavit or otherwise, that the opposite party could not be ready for trial in consequence thereof, a continuance may be granted, etc., amending a pleading does not entitle the opposite party to postponement of a trial as a matter of course.

3. Under Rev. St. 1899, Sec. 688, providing for a continuance on amendment of pleading, where, in an action against a street railway for injuries sustained by plaintiff while boarding a car, the complaint was amended by the insertion of the word "negligently" before the allegation of the acts causing the injury, there was no abuse of discretion in refusing a continuance.

4. Where, in an action against a street railway for injuries received by plaintiff while boarding a car, the evidence showed that plaintiff was knocked unconscious, sustaining an injury to her coccyx, which was treated as a fracture, plaintiff being kept in a plaster cast for ten days, there being a tenderness across the back, plaintiff suffering great pain, not being able to bend her leg without causing distress, and remaining in bed three or four weeks, being visited by a physician thirty-five times, and, moreover, suffering from nervous shock and an ailment resembling nervous prostration, being sometimes in a semi-comatose condition, that her back was hurt so she could not move for weeks, that she was nervous and restless and suffered great pain, and, though previous to the accident a perfect woman, her health thereafter was poor, a verdict for $2,500 was not excessive.—(Keeton et al. vs. St. Louis & M. R. Ry. Co.,92 S. W. Rep., 512.)

MISSOURI. — Carriers — Injury to Passenger — Negligence — Question for Jury—Appeal—Harmless Error—Instructions—Assuming Uncontradicted Facts—Trial—Instructions Partially Erroneous—Jumping to Avoid Collision.

1. In an action against a street railroad company for injuries to a passenger who jumped from a moving car because of fear that the motorman would not stop before reaching an obstruction on the track, evidence held to require submission to the jury of the issue of defendant's negligence, even though it should be conceded that the apparent obstruction was so located that it would not, in fact, have injured the car.

2. Where, in an action against a street railroad company for injuries to a passenger who jumped from a moving car because of fear that the motorman would not stop before striking an obstruction on the track, the petition alleged that the obstruction was in plain view of the motorman; an instruction allowing a recovery without proof of this was not reversible error in view of uncontradicted evidence that the motorman knew of the obstruction.

3. The assumption in instructions of facts proved by uncontradicted evidence is not ground for reversal.

4. It is proper to refuse an instruction partly correct and partly erroneous.

5. Where a passenger was injured by jumping from a moving street car to avoid an apparently impending collision with an obstruction on the track, it is immaterial whether the obstruction was in "plain" view or not, or whether the action of other passengers increased her alarm.—(McManus vs. Metropolitan St. Ry. Co., 92 S. W., Rep., 176.)

NEW JERSEY.—Death—Wrongful Death—Action by Surviving Husband—Distribution of Fund Recovered—Damages—Instruction.

1. The husband of deceased wife may, as her administrator, maintain an action, under the act entitled "An act to provide for the recovery of damages in cases where the death of a person is caused by wrongful act, neglect or default, approved March 3, 1848" (Gen. St., p. 1188), against a person or corporation whose wrongful act, neglect or default has caused her death, to recover for the pecuniary loss resulting to the next of kin.

2. The husband is not next of kin of his wife, within the meaning of the act of March 3, 1848 (1 Gen. St. p. 1188, Sec. 11), and is not entitled to share in the distribution of the fund recovered under that act.

3. The fund recovered under the act of March 3, 1848 (Gen. St., p. 1188), is no part of the estate of the deceased, and the administrator receiving it, whether the husband of the deceased or a stranger, is a mere trustee for its distribution to the next of kin in the method pointed out by the statute.

4. When the trial judge states to the jury what elements may enter into the ascertainment of the damages, to the exclusion of all other elements and subject matters, he is not required, even upon request, to enumerate and particularize certain of the elements and matters which are necessarily excluded from the consideration of the jury by the specific language or clear import of the charge as delivered.—(Gottlieb vs. North Jersey St. Ry. Co., 63 Atl. Rep., 340.)

NEW YORK.—Damages—Issues and Proof—Personal Injuries—Appeal—Exceptions—Instructions.

1. In an action for personal injuries, the complaint alleged that plaintiff sustained a compound fracture of his skull; that his arm, elbow, ankle, legs and back were cut, bruised and contused; that the fracture was a permanent and incurable injury, and was and would be "the cause of plaintiff's being, becoming and remaining afflicted with diseases;" and that by reason of his said injuries "his physical and mental abilities have been and will remain impaired, lessened and destroyed." Held that plaintiff was entitled to prove an impairment of his eyesight, as well as any diseases directly traceable to the fracture of the skull or the injury to his arm, elbow, ankle and leg.

2. In an action for personal injuries, plaintiff's counsel, in presenting the case to the jury, stated that he proposed to offer proof that plaintiff's eyesight had been impaired. Defendant's counsel then objected that such proof would not be admissible under the complaint, and the court sustained the objection, and so instructed the jury, to which an exception was taken. The question was also presented on the examination of plaintiff's witness when the testimony was excluded by the court, and an exception taken thereto. Held that plaintiff was not required to take an exception to the charge of the jury bearing upon the question of damages.—(Rudomin vs. Interurban St. Ry. Co., 98 N. Y. Sup., 506.)

NEW YORK.—Carriers—Injury to Passengers—Actions—Res Ipsa Loquitur—Evidence—Sufficiency—Trial—Instructions—Credibility of Witnesses.

1. The maxim res ipsa loquitur is applicable to a case where a passenger in a street car is injured by the fall of a device used for registering fares.

2. In an action against a carrier for injuries to a passenger owing to the fall of a device used for registering fares, evidence considered, and held sufficient to warrant a finding that there had not been proper inspection on the part of the carrier.

3. In an action for injuries to a passenger owing to the fall of a device used for registering fares, the court instructed that defendant's witnesses had testified that the fall was caused by the breaking of an iron prong owing to a flaw therein, which could not have been seen until after the iron had been broken, and that it was for the jury to pass upon the credibility of such witnesses. and say whether their testimony should be accepted, and that, if

the evidence appeared to be a satisfactory explanation, there should be a verdict for defendant. Held that the instruction was a proper one on the credibility of defendant's witnesses, and it was not error for the court not to have told the jury explicitly that they should find a verdict for defendant if they believed its witnesses.—(Weir vs. Union Ry. Co. of New York City, 98 N. Y. Sup., 268.)

NEW YORK.—Carriers—Passengers—Negligence—Question for Jury—Position—Care Required—Contributory Negligence.

1. Where one of the rails of defendant's horse-car track had been depressed from 4 to 6 ins. below its opposite rail for several days during improvements in the street, which depression extended about 3 ft. along the track, making a sharp pitch hole, over which defendant's car at the time of the accident was rapidly driven, and by the bounding of the car intestate was thrown from the front platform, on which he was riding as a passenger, and killed, whether the carrier was guilty of negligence was for the jury.

2. While a passenger standing on the front platform of a street car is not guilty of negligence by such fact alone, he nevertheless owes to the carrier some precaution, either by the manner of standing or by grasping some support, to guard against losing his balance by an sudden motion of the car.

3. Where, in an action for death of a street car passenger by being thrown from the front platform of the car by a sudden jolt thereof, there was no evidence describing the manner in which deceased was standing with reference to bracing himself, nor whether he had hold of any part of the car just prior to the accident, nor any facts from which the jury could have inferred that deceased was taking any precaution whatever to guard against losing his balance, plaintiff failed to establish that deceased was not guilty of contributory negligence—(Depew vs. New York City Ry. Co., 98 N. Y. Sup., 276.)

NEW YORK.—Street Railroads—Collisions With Vehicles on Track—Rate of Speed—Negligence as Matter of Law—Actions—Contributory Negligence—Sufficiency of Evidence—Evidence—Prior Accidents—Error—Reversible Error.

1. The fact that a street car is running in a sparsely settled and little frequented locality at a speed of from 15 to 20 m. p. h. is not, of itself, negligence as a matter of law with respect to a collision with a vehicle on the track.

2. In an action against a street railway for injuries resulting from a collision between defendant's car and plaintiff's wagon, evidence examined, and held to show contributory negligence on the part of the driver of the wagon.

3. In an action against a street railway for injuries resulting from a collision between defendant's car and plaintiff's wagon, the admission of evidence that defendant's motorman had previously been concerned with an accident was erroneous, although it may not have affected the result, and would not, of itself, call for a reversal.—(American Ice Co. vs. New York City Ry. Co., 98 N. Y. Sup., 219.)

NEW YORK.—Master and Servant—Injury to Servant—Obvious Danger—Negligence of Employer—Question for Jury—Contributory Negligence—Question for Jury—Assumption of Risk—Appeal—Reservation of Grounds of Review—Hypothetical Questions.

1. The danger of an employee receiving an electric shock while clearing snow from an elevated railroad with an iron shovel, in consequence of the same coming in contact with the electrically charged third rail and another iron connected with the track, thereby producing a short circuit, is not an obvious danger, and is one which a layman is not likely to know unless specially instructed, or unless he happened to observe the effect.

2. In an action for injuries to an employee, evidence considered, and held that the question whether the employer was negligent in failing to furnish the employee with a wooden shovel instead of an iron one, with which to clear snow from an elevated railroad, or in failing to instruct him as to the danger of striking the shovel against the third rail and another piece of iron on the track, was for the jury.

3. Whether the employee was guilty of contributory negligence. Held for the jury.

4. The question whether the employee assumed the risk. Held for the jury.

5. Where, in a personal injury action, the evidence showed that molten iron was precipitated into plaintiff's eye, the error in allowing a medical expert to testify in answer to a hypothetical question based on molten lead being precipitated into the eye was not reversible error; the attention of the court not being called to the fact that the question assumed that the metal was lead—(Smith vs. Manhattan Ry. Co., 98 N. Y. Sup., 1.)

NEW YORK.—Street Railroads—Negligence—Defective Tracks—Notice—Stipulation—Admissions—Injury to Bicycle Rider—Trial—Directing Verdict.

1. Where, by the construction of a subway beneath the roadbed of a street railway, a trolley slot thereon would spread at times about an inch for a distance of 2 ft, and a bicycle rider was injured because thereof, and the evidence showed that the slot was safe up to within a short time prior to the accident. the street railway company was not chargeable with notice of the condition, so as to make it liable on the theory of negligence.

2. Where, in an action against a street railway for injuries to a bicycle rider caused by the spreading of the slot in the track, a stipulation by defendant, admitting that it maintained the slot on which plaintiff was riding when injured, is not an admission that it was responsible for the condition of the slot at the time of the accident.

3. Where, a street railway company was sued for injuries to a bicycle rider by the spreading of the slot in the track, it could show under the general denial that it was not responsible for the spreading of the slot, which was the cause of the accident.

4. Where, at the close of the trial both parties request the direction of a verdict, any question of fact which the evidence may present is submitted to the court.—(Griffin vs. Interurban St. Ry. Co., 94 N. Y. Sup., 854.)

WASHINGTON.—Carriers—Injury to Street Railway Passenger—Negligence—Trial—Directing Judgment.

1. Testimony that just as a street car was slowly turning from an avenue onto a street the conductor, at the instance of a passenger on the back platform, signaled to stop the car, whereupon the passenger crossed the platform and took his position on the lower step of the car, with his hand on the stanchion, ready to alight when the car stopped; and that, instead of stopping, the motorman increased the speed of the car so that it was going 8 or 10 miles when or soon after it got round the curve, and that the passenger was thrown off, is sufficient to go to the jury on the question of negligence of the persons operating the car in leading the passenger into a place of danger and throwing him off his guard.

2. Where there is evidence to support plaintiff's case, the court may not direct judgment for defendant, though the preponderance of evidence is so great for it that a verdict for plaintiff could be set aside as against the evidence. Judgment can be directed only where the granting of a non-suit would be warranted.—(Weir vs. Seattle Electric Co., 84 Pac. Rep., 597.)

WISCONSIN.—Action—Conditions Precedent—Notice of Personal Injury—Disability of Infancy—Constitutional Law—Right to Remedy for Injuries.

1. Laws 1897, p. 678, Chap. 304 (Rev. St. 1898, Sec. 4222, subd. 5), providing that no action for an injury to the person shall be maintained, unless within one year after the happening of the injury notice shall be given to the person liable therefor, is not a statute of limitations within Rev. St. 1898, Sec. 4233, providing that if a person entitled to sue shall be within 21 years of age, the time of his disability shall not be a part of the time limited for the commencement of the action, but imposes on all persons, including minors, the obligation to serve such notice in order to maintain an action.

2. The notice of a personal injury is sufficient within Laws 1897, p. 678, Chap. 304 (Rev. St. 1898, Sec. 4222, subd. 5), declaring that no action for a personal injury shall be maintained, unless within one year after the injury, notice in writing, signed by the party damaged, his agent, or attorney, shall be served on the person liable therefor, when it shows that it is given on behalf of the person injured, and the father may give such notice on behalf of an injured minor.

3. Laws 1897, p. 678, Chap. 304 (Rev. St. 1898, Sec. 4222, subd. 5), providing that no action for a personal injury shall be maintained, unless within one year after the injury notice is served on the person liable therefor, gives a reasonable time within which to serve the notice in actions accruing after its passage, and it is not, when applied to such actions, in conflict with the fourteenth amendment to the Federal Constitution, or with Const. art. 1, Sec. 9, declaring that every person is entitled to a remedy in the laws for all injuries.—(Hoffmann vs. Milwaukee Electric Ry. & Light Co., 106 N. W. Rep., 808.)

LONDON LETTER

(*From Our Regular Correspondent.*)

The result of the working of the Metropolitan District Railway Company under the complete scheme of electrification which has been in operation now for some time, must be said to be distinctly disappointing, and a few of the details given by Sir George Gibb, at the half-yearly general meeting held recently, show traces of the difficulties under which company has been working since the scheme was completed. The total capital expenditure up to June 30, in connection with the electrification of the railwav and all its concurrent improvements, amounted to £1,783,000, and during the half-year under review, the company had carried over 32,750,000 passengers, which is an increase of over 5,000,000. As far as numbers are concerned this is a record, but, unfortunately, the expenses have also increased in an almost alarming ratio, and the net result is that after paying the dividends on the guaranteed stocks, there is a deficiency of nearly £50,000. Sir George spoke most confidently of the excellence of the rolling stock and the complete apparatus in connection with the electrification, though a good deal would yet have to be done in modifying the bogie trucks on which the carriages were mounted, these having caused considerable trouble. As has been frequently mentioned in this column, the prices of transportation in London have been steadily falling for years, ever since, it may be said, the Central London Railway, commonly known as the twopenny tube, was opened. In common with all other transportation companies the District Railway has decreased many of its fares, and it would appear from Sir George's report that the directors have now come to the conclusion that these have been reduced in too great a degree, so that, commencing with September they have resolved to materially increase these fares, taking care, however, to do so in such a way that passengers will feel the increase in the least possible degree. The carriage, for instance, of workmen at a very low fare has resulted in an almost alarming increase in this portion of traffic. Workmen's fares have increased in the last ten years from 5,000,000 to upwards of 16,000,000 per annum, and as they work out at only .65d. per passenger, the company is resolved to make some substantial increase in these fares. The cheap return fares will also be done away with, and though the company does not propose to resume the old fares, which were too high, the special reductions will be largely made in the return tickets. The directors are still confident that much better results will appear in the future, and it is to be hoped from every point of view their anticipations will be at an early date realized.

There has been a modern battle of Hastings—the battle of the Sunday trams. For some time past there has been a growing demand for the running of Sunday trams in this historical city by the sea, and as has been the case in most other cities in Great Britain, the progressive element has again won the day. As in other cities it was decided a few weeks ago to submit the whole thing to public ballot, the papers containing a simple question as to whether the voter was in favor of the running of Sunday tramways or not. The result is a majority of 1420 in favor of Sunday tramways in a total vote of nearly 6800. The subject has given rise to columns of literature in the local daily press and in circulars, to huge posters on walls and in windows, to sermons in the various churches, and to much amusing poetry of the usual election character. The ballot was comprehensive in character, and allowed not only heads of families but their wives and frequently their sons to vote, and it is now alleged that many members of families are not on speaking terms.

An important announcement has just been made by the directors of the Midland Railway Company, stating that they intend to electrify the 8 miles of their line which lie between Heysham Harbor (which it will be remembered is the new Midland route to Belfast), Monecambe and Lancaster. There are not many details available at present, but it is announced that it is intended to work this line on the single-phase system, and the present power house at Heysham Harbor, recently equipped by the British Westinghouse Company, will be utilized for the furnishing of the necessary current. Catenary overhead construction will, of course, be used, the voltage being 3300 at 25 cycles. The through trains will not be operated at present, the electric service being proposed only for local trains. The neighborhood is not one from which any great results are expected from a statistical point of view, as the traffic is not dense, but the application will be looked upon as an experimental one from which greater developments will arise in the future.

An equally interesting piece of information which has recently been made public by Lord Stalbridge, who recently presided at the half-yearly meeting of the London & North Western Railway Company, is that the company, provided that the shareholders approve of the scheme, intends to apply for powers to make an entirely new electric railway from its present terminus at Euston to Watford, a distance of over 17 miles. The necessity for such a line has been brought about by the demand for increased suburban service, which the company cannot at present expand to any great extent without seriously interfering with the work of its long-distance traffic, which perhaps at the present moment is the best conducted in the world. The proposed line is intended to run partly alongside and partly under the present main line, with a loop and local station under the present Euston terminus. By having the new station at Euston underground, the company will be able to afford connection with the City & South London Railway and the Charing Cross, Euston & Hampstead Railway. This is a most important development in the right direction, and will undoubtedly be of vast service in developing the suburban services of this most important railway, and also in vastly increasing the comfort of passengers on main line trains.

The London County Council is proposing an extensive scheme of new tramways for which approval will be sought at the next Parliamentary session. These schemes will embrace a total mileage of 33½ miles, all of which, with the exception of 6 miles, represent new lines. A total of £700,000 will be necessary for the equipment, the estimates providing for the use of the conduit system, as already installed in most of their tramways, except in certain places where the overhead trolley system is deemed advisable. One of the most important schemes is a double line of tramways from the Marble Arch by way of Edgware Road and Maida Vale to Cricklewood, a distance of 7½ miles. Another important scheme is the line of tramways which will eventually be placed on Hampstead Road, a portion of the line being laid by way of Seymour Street across Euston Road, via Woburn Place, Tavistock Square and Russell Square, joining with the existing lines at Southampton Row. The other portion of this same scheme will be by way of Hampstead Road across Euston Road and along Tottenham Court Road to Francis Street, Gower Street, Bedford Square and New Oxford Street. These lines will join at Hampstead Road with the existing tramways which run northwards to Highgate and other northern suburbs, which will also soon be electrified. Other important schemes are in the southern suburbs in the vicinity of Wandsworth and Putney, while two important schemes are intended to provide increased facilities for approach to the Crystal Palace, and it is also proposed to extend the existing tramways at Streatham to the county boundary at Norbury. In conjunction with the work which the Council already have authority for these will create an extensive system of tramways, and there are no real good reasons why the powers sought should not be granted.

The electric tramway service over the new Vauxhall Bridge has now commenced, and cars are now running from Victoria to Catford, via Camberwell and Peckham. A portion of the London County Council's new electric tramway from Tooting Broadway to the Hop Exchange, via Garrett Lane, Wandsworth, Battersea and Vauxhall, has also been opened. Mr. John Burns, M. P., rode on the first car from Tooting, and expressed himself as highly gratified with the new route. The remaining portion of the route is expected to be in full working before Christmas. It is also interesting to note that the Royal assent has now been given in the House of Lords to the London County Council Tramways and Improvements bill for the construction of tramways over Westminster Bridge and along the embankment, to meet the proposed tramways over Blackfriars Bridge, which the City Corporation have agreed to widen.

The highways committee of the London County Council reports that it is taking the necessary steps in connection with the appointment of the committee suggested by the Admiralty to inquire whether the working of the Greenwich electricity generating station will have any injurious effect upon the Royal Observatory, Greenwich. Arrangements have been made with Sir Benjamin Baker to act as the Council's representative on the committee. It has also been thought well that the Council should obtain the assistance of an expert from the astronomical and scientific point of view, and in that connection arrangements have been made with Prof. C. Boys to act in an advisory capacity to the Council. The representatives appointed by the Admiralty on the committee are Prof. J. A. Ewing and Lord Rosse.

The historic town of Stirling, in Scotland, and the beautiful residential town of Bridge of Allan, in the immediate vicinity, have for years been connected by an indifferent system of horse tramways. Many attempts have been made to produce something better, and it is, therefore, a matter of congratulation that the

National Electric Construction Company, Ltd., of London, has acquired the Stirling & Bridge of Allan Tramways for the sum of £10,000 in cash and £9,470 in shares of the National Company. It is intended at once to proceed with the electrification of this line, the electrical energy being taken from the Stirling Corporation. Should the undertaking prove to be a success, the line will probably be extended to Bannockburn on the south and Dunblane on the north, with probable further extensions along the foot of the Ochil hills.

One good result of the accident to an electric car at Highgate Archway has been the renewal of the tramway cars used by the Highgate Hill Steep Grade Cable Company, whose service has been running from the Archway to the top of Highgate Hill for the past twenty years. After the accident, the Metropolitan police stopped the running of these cars until some kind of guarantee was given that they would be remodeled and better equipped with brakes. The whole service was therefore stopped for some little time until a new car with the necessary improvements was put in service, and on the company's guarantee that it would remove all the old vehicles and put on equally good new ones, the service was permitted to be resumed.

Mr. J. F. C. Snell has resigned his position as borough electrical engineer of Sunderland, having decided to come to London as a consulting electrical engineer, and the committee has determined to advertise for a successor at a commencing salary of £800 per annum. Mr. Snell was engaged at the last Parliamentary inquiry into the London County Council's bill for supplying the London area with electricity in bulk, and it is probable that he will be asked by the London County Council to accept a retainer for the next Parliamentary session. Mr. Snell is a young man of marked ability, and his conduct of the electrical affairs of the city of Sunderland has been one of continued success, so that it is confidently expected that before very long he will become one of the most respected of the consulting electrical engineers in the Metropolis.

The dispute between the Manchester Corporation and its tramway employees has recently been settled by the arbitrator, a member of the Board of Trade. His decisions are decidedly against the men, as he states that he is of opinion that if the concessions demanded by the men were granted, not only would heavy charge be entailed on the rate payers, but the employees would receive benefits from the undertaking quite out of proportion to those to which they are reasonably entitled. The result is that the men will lose the concession which the tramways committee were prepared to grant, and will, in addition, have to pay the costs of the arbitration. Curiously enough, almost concurrently with this decision, comes the statement that the Salford tramway men are applying for an increase of pay, which the Salford Corporation are by no means willing to allow. The matter is at present under discussion, but it would appear that the Salford men are being well treated, and with the Manchester decision staring them in the face it is not likely that they will proceed much further with their complaint.

Mr. John E. Pitcairn, who has been for over twenty years general manager of the tramways in Edinburgh, has tendered his resignation. In accepting it, the directors of the Edinburgh & District Tramways Company, Ltd., have minuted that they have done so with great reluctance, and have voted him a retiring allowance. Mr. Pitcairn has seen the original Edinburgh street tramways undertaking taken over by the town, the conversion of horse haulage into cable traction, and the extension of the system to the suburbs; and largely to him is due the present admirable organization of the tramway system in the city. Mr. Shepherd, the new manager, is a native of Plymouth. He acquired his experience under the Manchester Tramway & Carriage Company, of which he was for a time a branch manager. When the concern was taken over by the Corporation he was elected outside superintendent. From Manchester he went to Bradford as traffic superintendent, and inaugurated there a system of overhead trolley electric traction. In 1903 he came to Edinburgh to be traffic superintendent of the Edinburgh & District Tramway Company, of which he has now been appointed general manager and secretary.

In considering the electrification of the Edinburgh tramways the municipal authorities have been looking into the merits of the surface contact system. Requests for information as to the practical operation of lines equipped with the surface contact studs, of the town clerk in each municipality in England, and have developed the following facts: Wolverhampton has 20 miles laid with the Lorain system. The cost of construction of permanent way per mile is reported as £5,665; full electrical equipment, including feeders, etc., £2,735, total £8,400 per mile. Working cost per car mile, as per last balance sheet, 6.5d. The Lorain system has now been in operation since January, 1902. The working during this time has been satisfactory in every degree, and the working costs compare favorably with those of the overhead system. The financial results also are favorable, after allowing fully for depreciation. In Lincoln, 3 miles have been laid with the G. B. contact system, which works out at about 10 per cent more than the inclusive cost of track and electrical equipment on the overhead system. As the cars have only been running for seven or eight months figures are not available for up-keep, etc., but it would appear that the citizens generally speak very favorably of the way in which the service has been conducted. It is said that if the system costs no more proportionately for up-keep during the next six months than it has during the last the cost of up-keep should compare very favorably with that of the overhead system, and the same remark applies to the current consumption, which at present is very little more than would be the case with the overhead system. The town of Mexborough is installing a surface contact system, but can give no information yet. Dresden, in Germany, has both the Dolter and Kingsland systems in experimental use, but Dr. Matther, the town clerk, states that the cost is considerably more than the trolley, and that it is unlikely than any surface contact system will be adopted.

The auditors of the Liverpool Corporation electric tramways undertaking have just issued their report upon the accounts for the year 1905. It is interesting to note that the car receipts for the year amounted to £550,083, an increase in the twelve months of £9,233, and the passengers carried reached the high total of 119,123,644, the figures showing an increase over the previous year of no fewer than 2,480,981. Yet notwithstanding this great additional traffic, it is recorded that the mileage run has been reduced to 12,066,963, a decrease of 99,456 miles as compared with the year 1904. The pasenger receipts per mile averaged 10.940d., as against 10.669d. for 1904. The revenue account produced a surplus of £175,677, leaving, after payment of sinking fund and interest charges, a net surplus of £75,959, and of which two-thirds was placed to the reserve fund and the balance, £25,319, paid over in relief of rates. The amount set aside for renewals and depreciation, £88,814, is equal to 7.68 per cent on the capital sum of £1,156,597 in connection with the establishment of the undertaking. The reserve fund stands at £214,398.

The highways committee of the London County Council reports that during the year ended March last the Council's southern tramways earned £782,210, £626,860 being the receipts from the electric cars and £155,350 from the horse cars. The working expenses amounted to £561,755. The gross surplus of receipts over expenses was £220,454. Debt charges, etc., amounting to £174,853, and other charges left a net surplus of £2,319 to be carried to the appropriation account. This compares with a net surplus of £7,054 in 1904-5, when the same amount was set aside for renewals, and other special charges were made. The committee states that the working expenses for electric traction have been considerably heavier than they are expected to be when the permanent generating station at Greenwich is used to full advantage and the temporary stations are wholly dispensed with. On the whole, the results of the year's working (which are considerably more favorable than was anticipated in the annual estimates) are regarded as being very satisfactory.

The Llandudno & District Electric Tramway Construction Company, Ltd., has been registered, with a capital of £100,000. The objects are to adopt agreements (1) with the Carnarvonshire Electric Traction Syndicate, Ltd., relating to the acquisition of certain light railway orders authorizing the construction and working of certain lines of electric light railway between Colwyn Bay, Llandudno and Deganwy, together with the undertaking of the Llandudno & Colwyn Bay Electric Traction Company, Ltd., subject to certain liabilities; and (2) with Bruce Peebles & Company, Ltd., relating to the completion of the construction and equipment of the said light railways or part thereof, and to carry on the business of tramway, railway, omnibus and electrical, steam or other mechanical carriage and van proprietors, carriers of passengers and goods, electricians, engineers, etc.

The Sheffield City Council has received an interesting report with respect to the maintenance of the existing electric tram system. Special importance is attaching to the matter in that Sheffield has adopted a universal penny fare from the center of the city to all suburbs, a system the soundness of which has been severely criticised. By it passengers are carried in some instances as far as 3¾ miles for the penny, a cheaper rate than has been attempted either in this country or on the Continent. Notwith-

standing this the Council finds that the income of the undertaking is sufficient for its needs, and that reasonable assistance out of the surplus will probably be available year by year in aid of the rates. It has been decided to establish a renewals fund of £75,000, and to put aside each year towards renewals an amount equal to 1 penny per car mile traveled, which will realize about £26,000 or £27,000 per year. That sum, it is considered, will be sufficient to meet all calls on this account, through it is pointed out that neither Sheffield nor any other city has yet had sufficient experience to guide them to any exact figure.

The Glasgow tramway accounts were submitted for approval at the Town Council recently. Councilor Alexander, in moving their adoption, said that while the revenue had been greater, the net surplus was reduced by £37,000. This was largely due to the fact that expenses for the maintenance of track had amounted to the enormous sum of nearly £70,000, or about £40,000 more than in the previous year. He could not promise that the surplus would be any larger next year, so that there would not be any balance to enable them to increase the halfpenny-fare distances. Replying to critics, he pointed out that whilst the department had borrowed practically three millions, the debt at present amounted to only £1,700,000. In twelve years they had paid to the common good £191,000, whilst in twenty-three years the private company, which formerly leased the streets, paid only £63.000. The accounts were adopted.

The first step towards the municipalization of the tramways in the Rossendale Valley has been taken by the Rawtenstall Town Council, which has decided to purchase the tram lines in the borough, extending to Waterfoot, Crawshawbooth and Lamb Row, Haslingden.

A series of trial runs have been made on the Wemyss & District Tramways system with most satisfactory results. The line begins at Leven and joins on to the Kirkcaldy Corporation system at Gallowtown. A feature of the line is the fact that for three-fourths of the distance—7¾ miles—it runs through fields, and thus does not disturb traffic on the public highway. Through cars are to be run in connection with the express trains at Kirkcaldy, so that the tramway is likely to be patronized by golfers from Edinburgh and Glasgow. A. C. S.

DETAILS OF THE SALE BY THE NEW HAVEN COMPANY OF ITS TROLLEY PROPERTIES

Official announcement was made in Boston last Thursday of the details of the sale of the New York, New Haven & Hartford Railroad of the electric railway properties in Massachusetts, which it operated through the Consolidated Railway Company. Mention of the sale was first made in the STREET RAILWAY JOURNAL of Aug. 25, all the facts being given at that time that were then available for publication. This matter is now supplemented by the following official notice:

The transaction by which the street railway companies in Massachusetts formerly owned by the Consolidated Street Railway Company of Connecticut have passed from the control of that company is a sale in fact as well as in name.

A voluntary association, the New England Investment & Security Company, was organized and took over all the shares of the Massachusetts trolleys owned by the Consolidated Company, with the exception noted below. The Consolidated Company received in exchange therefor the promissory notes of the New England Company, all the preferred and common shares of the New England Company having been turned over to bankers for sale. The preferred shares of the New England Company represent the value of the property sold. They are guaranteed by the Consolidated as to 4 per cent dividends and $105 per share in liquidation.

In consideration of the Consolidated affixing its guaranty to these preferred shares it received the proceeds of the common shares of the New England Company. These common shares were sold by the bankers to gentlemen, many of whom are prominently identified with interests of the New Haven Railroad. These gentlemen purchased these common shares from their personal funds and their ownership is of a purely personal nature. The common shares do not represent much property value, and, therefore, the price paid was based on prospective rather than present value.

So far, the New England Investment & Security Company has issued $10,000,000 preferred stock and $10,000,000 common stock. The preferred shares are in the hands of a prominent banking house for sale and will doubtless be put out to yield the New England Company something like par. Bearing the guaranty of the Consolidated company and being non-taxable Massachusetts stock, it is expected these shares will be in strong demand.

This transfer does not mean that the Consolidated management believe that their previous position was untenable. They were of opinion that a of these trolley companies with an inflamed state of public opinion adverse to them; and having assumed that the action of the State authorities public service corporation cannot to-day successfully perform the service represented dominant public opinion in the commonwealth, they acted in deference to what that opinion seemed to be, but nevertheless with entire confidence that their previous position was legally right and proper and in the best interests of the public they endeavor to serve.

The management of the Consolidated were aware also that some of these trolley minority stockholders whose interests would doubtless be jeopardized in litigation, not because of any fault of their own, but merely because an outside company had stepped in and bought control of the companies in which these individuals had minority interest.

Furthermore, the management of the Consolidated, no matter how firmly they believed their position to be legally right, could not consistently with the dictates of prudence jeopardize in litigation stockholders' equities representing millions, when the benefits of such litigation might be had in a much simpler way.

Partly at least for this reason they have not sold all of the trolleys, but have retained one system, consisting of two small roads, the Worcester & Webster and the Webster & Dudley. The entire stock of these roads is to-day in the possession of the Consolidated. These roads were leased to the Consolidated by virtue of an act of the Legislature of 1901, but their status is just the same as the status of the other trolleys which have been sold to the New England Company, so far as stock ownership is concerned, and any action of the State authorities in bringing a test suit.

We understand that the management of the Consolidated are perfectly willing, if the State authorities are sincere in their wish that the State law be tested, that this case be sent up to the courts on an agreed statement of facts for a decision, and they will in every way co-operate with the Attorney-General to facilitate a decision by the courts at the earliest possible moment.

The situation is now this: The New Haven Railroad owns all the stock of the Consolidated Street Railway Company of Connecticut. The Consolidated of Connecticut owns to-day all the stock of the Worcester & Webster and Webster & Dudley, in Massachusetts. Therefore, if under the laws of Massachusetts there is anything illegal in the New Haven Railroad owning the stock of a trolley company of the State of Connecticut, which in turn owns street railways in Massachusetts, here is a test case, the adjudication of which the Consolidated people will facilitate with all the means at their command.

Plans for the sale of these trolley companies were begun no less than a year ago, and the transaction was practically finished before the legislative hearing on Beacon Hill in June. The only effect the action of the State authorities had on the matter is that instead of the common stock of the New England Company remaining in the treasury of the Consolidated Company, it has passed instead into the hands of private individuals.

Meanwhile, the stockholders of the New Haven Railroad may be assured that their officers and directors are free from the charge of permitting the New Haven Railroad to be concerned in the direct or indirect holding of stock in Massachusetts trolley companies; and that all the trolley companies formerly held by Consolidated interests in Massachusetts with the above noted exception have been sold not because their ownership was illegal, but in deference to Massachusetts public opinion.

ORANGE COUNTY TRACTION SOLD

The Orange County Traction Company, it is stated, has been purchased by a local New York syndicate, of which ex-Governor Odell is the head. The company owns about 20 miles of line. For three weeks there has been a strike of the regular employees, and strike breakers have been running the cars. The men demanded the closed shop, an increase of wages of 5 to 15 per cent and other concessions. The new owners have made a settlement with the men and are said to have granted every demand.

TOLEDO & WESTERN DEAL OFF—PROPERTY WILL PROBABLY BE SOLD

The deal for the purchase of the Toledo & Western Railway by a Cleveland syndicate headed by J. R. Nutt has fallen through. The stockholders' committee which undertook to secure the stock for sale to the Nutt syndicate at $6.25 a share failed to get in much of the stock owned by Toledo people. The Toledo people tried to get more than the figure offered the other stockholders, and as a result the entire deal has been called off. The property will now probably go through sheriff's sale. A suit has been filed against the Toledo & Western Railway Company by the American Car & Foundry Company, because of the failure of the Railway Company to pay certain notes said to be due.

IOWA INTERURBAN EARNINGS IN 1905

The interurban railway companies of Iowa have filed their annual sworn statements with the Executive Council of the State, giving gross earnings, operating expenses, net earnings and other information for the use of the Executive Council in determining the values at which to assess these properties for taxation. The following is a brief summary of facts as shown by such statements for the year 1905:

The Interurban Railway Company, of Des Moines, reported 28.87 miles of track, same as in 1904; total gross earnings, $154,-733; gross earnings per mile, $5,359; total operating expenses, $81,309; operating expenses per mile, $2,816; total net earnings, $73,424; net earnings per mile, $2,543; total valu eof road, including buildings, lands, power plant and equipment, $328,164. After deducting taxes the company earned more than 21 per cent on this valuation. The gross earnings were $15,179 greater, the operating expenses $8,076 greater, and the net earnings $7,103 greater than for the year 1904. The company earned 19½ per cent in 1904, and nearly 19 per cent in 1903, on the total reported valuation for those years.

The Cedar Rapids & Marion City Railway Company reported 14.21 miles of track, same as in 1904; total gross earnings, $138,-182; gross earnings per mile, $9,724; total operating expenses, $100,086; operating expenses per mile, $7,043; total net earnings, $38,096; net earnings per mile, $2,680; total valuation, including buildings, lands, power plant and equipment, $179,031. After deducting taxes the company earned nearly 20 per cent on this valuation. The gross earnings were $14,208 greater, the operating expenses $3,311 greater, and the net earnings, $10,897 greater than for the year 1904 The company earned more than 15 per cent in 1904, and about 11½ per cent in 1903 on the reported valuations for those years.

The Waterloo & Cedar Falls & Northern Railway Company reported 54.73 miles of track, same as in 1904; gross earnings, $152,077; gross earnings per mile, $2,778; total operating expenses, $83,829; operating expenses per mile, $1,531; total net earnings, $68,248; net earnings per mile, $1,247; total value of the road, including buildings, lands, power plant and equipment, $591,910. The company earned over 10¾ per cent on this valuation after deducting taxes. The gross earnings were $16,929 greater, the operating expenses were $3,746 greater, and the net earnings $13,183 greater than for the year 1904. The company earned 9 per cent in 1904 and 8 per cent in the year 1903 on the reported valuations for those years.

The Mason City & Clear Lake Traction Company reported 14.62 miles of track, the same as in 1904; total gross earnings, $37,779; gross earnings per mile, $2,584; total operating expenses, $24,255; operating expenses per mile, $1,658; total net earnings, $13,524; net earnings per mile, $924; total valuation of road, including buildings, lands, power plant and equipment, $46,700. After deducting taxes the company earned over 24 per cent on this valuation. The gross earnings were $232 greater, the operating expenses were $4,673 less, and the net earnings $4,904 greater than for the year 1904. The company earned 13 per cent in 1904 and less than half of 1 per cent in the year 1903 on the reported valuations for those years.

The Tama & Toledo Electric Railway Company reported 2.75 miles of track, the same as in 1904; total gross earnings, $11,557; gross earnings per mile, $4,202; total operating expenses, $10,152; operating expenses per mile, $3,691; total net earnings, $1,405; net earnings per mile, $510. Total valuation of the road, including buildings, lands, power plant and equipment, $28,370. After deducting taxes the company earned 3 2-3 per cent on this valuation. The gross earnings were $786 greater, the operating expenses $1,145 greater, and the net earnings $360 less than for the year 1904. The company earned 5 per cent in 1904 and 12 per cent in 1903 on the reported valuations for those years.

The Cedar Rapids & Iowa City Railway & Light Company reported 27.63 miles of track, same as in 1904; total gross earnings, $85,030; gross earnings per mile, $3,077; total operating expenses, $53,789; operating expenses per mile, $1,946; total net earnings, $31,241; net earnings per mile, $1,130; total valuation, including buildings, lands, power plant and equipment, $394,462. The company earned nearly 7½ per cent on this valuation after making deductions for taxes. The report for the year 1904 only covered four and one-half months, the report for 1905 covers the entire year. The gross earnings were $60,749 greater, the operating expenses $36,681 greater, and the net earnings $14,068 greater than for the four and one-half months of operation during the year 1904. The company earned about 5 per cent on the reported valuation in 1904.

The Boone Suburban Railway Company reported 4.7 miles of track, same as in 1904; total gross earnings, $6,562; gross earnings per mile, $1,396; total operating expenses, $3,660; operating expenses per mile, $778; total net earnings, $2,902; net earnings per mile, $617. Total valuation of property, including buildings, land, power plant and equipment, $17,600. After deducting taxes the company earned 15 1-3 per cent on this valuation. The gross earnings are $565 less, the operating expenses $3,330 less, and the net earnings $1,415 greater than for the year 1904. The net earnings did not pay the taxes in 1904. The company earned about 14 per cent on the reported valuation in 1903.

The Iowa & Illinois Railway Company reported 32.968 miles of track; total gross earnings, $78,587; gross earnings per mile. $2,383; total operating expenses, $62,902; operating expenses per mile, $1,907; total net earnings, $15,685; net earnings per mile, $475. Total valuation of property, including buildings. lands, power plant and equipment, $1,462,494. The company earned about 1 per cent after making deduction for taxes. As the company only operated its line for about one month during the year 1904, there is no basis for comparison between the two years.

The total gross earnings of the eight interurban companies for the year 1905 was $664,510; the average gross earnings per mile, $3,682; the total operating expenses, $419,985; the average operating expenses per mile, $2,327; the total net earnings. $244,525; the average net earnings per mile, $1,349. The gross earnings for 1905 were $163,342 greater, the operating expenses $94,939 greater, and the net earnings $68,403 greater than for the year 1904. It must be remembered, however, that one company was only in operation one month during the year 1904, and another only four and one-half months during that year. All of the companies show a gain in percentage of earnings based on actual valuation of the properties. The Mason City & Clear Lake Traction Company has the highest percentage of earning capacity. returning 24 per cent on its valuation in 1905. The Interurban, of Des Moines, comes next, with 21 per cent, and the Cedar Rapids & Marion City Company third, with nearly 20 per cent. The Cedar Rapids & Iowa City Railway & Light Company make a very good showing for the first full year of operation, earning 7½ per cent on its actual valuation. The Iowa & Illinois Railway Company showed a balance on the right side of the ledger, but a small one. This company reports a valuation of $1,462,494, including expensive power plants, and net earnings of only about 1 per cent on such valuation. It is believed, however, that the company will be able to earn about 8 per cent on this valuation during the year 1906. And more than that thereafter, as the line connects two cities of fair proportions, and in all benefits a population of more than 125,000.

AGREED ON B. R. T. TEST CASE ON CONEY ISLAND FARE

Stephen C. Baldwin, representing Borough President Coler, conferred Friday afternoon at the offices of the Brooklyn Rapid Transit Company with former Justice Edward W. Hatch, and other legal representatives of the company, and an agreement was reached between the parties as to the form of test case to be brought for a definite settlement of the question of a 10-cent fare to Coney Island over the Brooklyn Rapid Transit lines.

Mr. Baldwin admitted that an agreement as to the method of procedure in the proposed test case had been agreed upon practically, and he believes that the case will be heard not later than October in the Court of Appeals. According to Mr. Baldwin, the case will assume the form of an omnibus cause, a suggestion put forward by counsel for the company, both sides believing that a satisfactory result would ensue from such a step, especially as all were agreed as to the form of procedure. Mr. Baldwin also expressed the belief that probably what was required thoroughly to smooth the situation regarding the collection of a second fare to Coney Island was the introduction in the courts of an individual case against a single line controlled by the company. That was his original contention, but rather than be held responsible for any delay in the adjustment of the papers, he yielded to the omnibus proposition put forward by the company's lawyers.

As the matter now stands the next step will be to turn the necessary papers over to Attorney-General Mayer, who will serve notice on the Brooklyn Rapid Transit that injunction proceedings have been instituted to restrain the company from charging more than one 5-cent fare to and from Coney Island on its lines. To this the company will make answer, and this move will be followed by argument before a justice at Special Term Supreme Court. Then, regardless of which side may win at Special Term, an appeal will be taken to the Appellate Division of the Supreme Court, and then a final appeal to the State Court of Appeals.

PUBLIC SERVICE INVESTMENT COMPANY

This company has recently been organized under the laws of the State of Delaware with $1,500,000 capital stock to act as a holding company for eleven Pennsylvania corporations forming the Valley Forge system near Philadelphia. Five of these companies have been organized under the general, or steam railroad, act, and their lines will be equipped with the third-rail system; four are organized under the street railway act and will distribute passengers on either side of the main line by means of surface trolley roads; one is a construction company and one is a spring water bottling company. The line extends northwest from the city of Philadelphia along the south side of the Schuylkill River, a distance of some 20 miles, to Phœnixville. The Montgomery Securities Company is the fiscal agent for the Public Service Investment Company, and the construction company, the Denbeigh Construction Company, will do all of the construction work. The officers of the Public Service Investment Company are: L. Knowles Perrot, chairman of the executive committee; David Rombold, Jr., president; E. W. Johnson, secretary and treasurer.

QUESTION BOX FOR THE ENGINEERING ASSOCIATION

Secretary Mower, of the American Street and Interurban Engineering Association, has issued a circular letter, stating that a question box will be discussed at the Columbus meeting, and requesting questions relating to the power house, overhead, mechanical or way departments, which members would like to have answered. Descriptions and illustrations of kinks, or homemade contrivances, for use in the question box will also be welcome. As this year's convention will be devoted particularly to the interests of interurban roads, so far as possible, questions should refer to interurban matters. No names will be attached to the questions in publishing them, but the names of those replying will be given unless request is made to the contrary. In order that the questions may be classified and distributed in good season, all questions and other matters should be sent to the secretary promptly. Mr. Mower's address is South Western Traction Company, London, Ont.

PLANS OF THE FORT DODGE, DES MOINES & SOUTHERN RAILWAY

The officials of the Fort Dodge, Des Moines & Southern Railway Company, which is constructing an electric line from Fort Dodge to Lanyan, where connection is made with the Newton & Northwestern, thence over the tracks of the latter company to Kelley, and thence to Des Moines over the new line now under process of construction, have made public a few of their plans. They announce that the road will be 90 miles in length, and that arrangements have been completed for an entrance into Des Moines over the tracks of the Des Moines City Railway Company. The connection with the tracks of this latter company is made near the city limits on the Flint Valley line. The company has already acquired control of the city railway system of Fort Dodge, and the new road will be operated in connection with said city railway. The work of constructing the line is now well under way. Gangs of graders are at work on the section between Des Moines and Kelley, and other crews of graders are in the vicinity between Lanyan and Fort Dodge. The work of constructing the large steel bridge over the Des Moines River, just south of Fort Dodge, has been underway for several months, and the officials state that the bridge will be completed in ample time. The graders at work between Des Moines and Kelley have practically completed the grading on 12 out of the 28 miles. Several miles of track have been graded between Lanyan and Fort Dodge. The work of laying the steel is now started. and the officials believe that the track will all be constructed and ready for operation by Jan. 1, 1907. The power house is to be constructed at Fraser, a point on the main line of the Newton & Northwestern, located about midway between Des Moines and Fort Dodge. It will be of brick and steel, and the capacity will be about 3000 hp. The generators will be driven by Westinghouse-Parsons turbines. The electricity will be distributed at 20,000 volts to five sub-stations. The officials state that the track and overhead construction will conform to the latest practice, and the roadbed will be specially constructed for the high speed of the passenger trains and for the heavy freight traffic already guaranteed. A striking feature of the road is that about 35 miles of the main line of the Newton & Northwestern, the section lying between Lanyan and Kelley, Ia., will be electrified. If the operation proves successful it is the intention of the officials of the Newton & Northwestern to electrify the whole length of the line from Newton to Rockwell City. Steam engines will be used for the hauling of freight over the line between Fort Dodge and Des Moines, electricity to be used for passenger service only.

STRIKE IN SAN FRANCISCO

With the exception of the California and the Geary Street lines, street railway traffic in San Francisco was suspended Aug. 26, as the result of a strike for higher wages by conductors and motormen of the United Railway system. The strike went into effect at 5 a. m. The railroads made no attempt to run cars, and there was no disorder. Further action in the strike awaits the arrival of Patrick Calhoun, president of the United Railways Investment Company. Although the California and Geary Street lines were in operation their limited equipment was inadequate. The employees of these two lines will not be called out, but they expect their employers to follow the lead of the larger company in any change that may be made in the wage scale. The demand is understood to be for a flat rate of $3 per day, with eight hours' work.

BOSTON & EASTERN COMPANY SEEKS RIGHTS

The Boston & Eastern Electric Railroad Company has filed with the Railroad Commissioners a petition, asking the board to issue a certificate that public convenience and necessity require the construction of an "interurban" electric railroad between the cities of Boston and Beverly, with a branch leaving the main line at Peabody and running to Danvers. The length of the proposed road, on the main line, is about 16½ miles, and the length of the branch line will be about 2 miles.

This is the first company to organize under the "interurban railroad bill," so-called, enacted by the last General Court, which was passed in order to allow of high-speed electric roads between large centers in this State. It is proposed to make the running time of express trains between Boston and Beverly 23 minutes.

Under the terms of the "interurban" act, fifteen or more persons may form an association for the purpose of building and operating an interurban railroad, which may be operated by electricity or any power other than steam. The road may be built entirely upon private land, but at least half of it must be on private land, and it is the intention of the promoters of the Boston & Eastern road to construct it entirely upon private land, and it will also be an elevated structure practically the whole distance, so that there will not be a grade crossing in the entire system. It will be necessary to construct tunnels in the city of Salem and in Lynn, on account of grades which cannot be overcome in any other way. The tunnels in Salem will be a sixth and a quarter of a mile long respectively, while the tunnel in Lynn will be nearly half a mile in length.

The new law requires that the capital stock of the railroad be at least $10,000 for each mile of track, but as the association has not as yet become incorporated it is not known what the amount of the capital stock will be.

With the petition the directors have filed a very elaborate set of plans, showing that the railroad proposes to have its Boston terminus in Sullivan Square, Charlestown, very near the present station of the Boston Elevated Railroad. From Sullivan Square the road will run in a northasterly direction along the side of the Charlestown playground and across the marshes to Everett, where it curves to the east and runs into the city of Chelsea, then northeasterly through Revere and Saugus to Lynn, where it runs very nearly through the heart of the city, going just south of City Hall Square. From City Hall Square the road takes a sweep to the north, and runs to the Salem line, cutting through a corner of that city and running through Peabody, after which it again enters the city of Salem and proceeds to its terminus at Beverly. The Danvers branch leaves the main line at the station between Pierpont Street and Main Street in Peabody, and runs direct to Danvers Square.

Under the present plans it is proposed to have nineteen stations on the road. divided among the cities and towns as follows: Boston 1, Everett 1, Chelsea 2, Revere 2, Saugus 0, Lynn 5, Peabody 1, Salem 3, Danvers 2 and Beverly 2.

ELECTRICITY ON THE MADISON STREET AND MILWAUKEE AVENUE LINES, CHICAGO

Electricity has been substituted for cable as motive power on the Madison Street and Milwaukee Avenue lines in Chicago. The last cable trains were run Sunday morning, Aug. 19, and the cars on the Madison Street lines arrived at the houses in a rather dilapidated condition, due to the efforts of passengers to celebrate the change of power. When the houses were reached, almost everything in the way of furnishings or fittings that could be pried or broken off had been removed by souvenir collectors. The train previous to the last one was subjected to even greater abuse. Believing it to be the last one, the passengers at Sheldon Street seized the gripman and conductor, and, after stopping the train, wrecked it by throwing the cars over on their sides. According to General Manager Roach, the North Side cable lines will be ready for electric operation within thirty days. The change of power on these lines will permit work to begin on the lowering of the La Salle Street tunnel. Preliminary work on the lowering of the Washington Street tunnel will be begun by Angus Brothers & Company at once. Steel for the new roof construction for this tunnel, as well as for the Van Buren Street tunnel, will be received about Sept. 1.

FRANCHISE SOUGHT IN LOS ANGELES

For some time the Los Angeles Pacific Company has been desirous of obtaining a franchise to build and operate a double-track railroad through a tunnel to be constructed on Hill Street, between First and Temple Streets. Several times the company has tried to secure this privilege, but found it impossible to do so except with the twenty-one year limit clause attached. However, this bit of trackage has become so necessary for the carrying out of the company's extensive improvements that an ordinance has at last been presented to the City Council asking that the Los Angeles-Pacific Company be granted the right to construct tracks, and for a period of twenty-one years thereafter to maintain the same and operate a double-track railroad through the tunnel to be constructed on Hill Street, between First and Temple Streets. The ordinance also asks a similar privilege for tracks under California Street and lands belonging to the city between California Street and Sunset Boulevard, and to connect with the Los Angeles-Pacific tracks now on Sunset Boulevard. It is asked that privileges be granted subject to the conditions that there shall be deducted from the total cost of the tunnel $8,000 and that the Los Angeles-Pacific Company pay one-half the remaining cost; and that the company shall construct all necessary flumes and culverts for the passage of water under the tracks; that the city shall have the right, at the expiration of twenty-one years, to purchase the track, provided that the option to make such purchase shall have been declared not more than three years nor less than six months before the expiration of the period by resolution of the City Council. Should the city wish to purchase the road at the time mentioned, its value is to be determined by a board of arbitrators.

NEW PUBLICATIONS

"Moody's Manual of Railroads and Corporation Securities for 1906." New York: The Moody Corporation. 2800 pages. Price, $10.00.

This book comprises ten sections, devoted respectively to: Membership lists on various stock exchanges, Government and State securities, steam railroads, electric traction companies, gas and electric light companies, water supply companies, telephone, telegraph and cable companies, industrial corporations, mining and oil companies, financial institutions. The industrial section has been the especial field of the manual since its first issue, and comprises 400 pages. The electric lighting section has over 1000 entries.

"Stray Currents from Electric Railways." By Dr. Carl Michalke, translated and edited by O. A. Kenyon. New York: McGraw Publishing Company. 101 pages. Illustrated. Price, $1.50.

Troubles with electrolysis, as with cross-induction from railway circuits to telephone circuits, have now practically passed away from American practice, due partly to improved bonding and partly to a better knowledge of the causes of and means for preventing action of this kind. In spite of the tremendously greater extent of the American electric railway systems and their higher average potential drop, the subject has never attracted here the attention that it has abroad, where the governmental authorities early adopted, and have since retained, the erroneous idea that the extent of the potential difference between rails and pipes is the criterion of electrolytic damage. The drastic British and German rules based upon this assumption have had the effect of compelling foreign electrical engineers to give much more attention to devising methods for reducing potential differences than to lessening the destructive current flow in the pipes, and have resulted in the complicated negative booster and other return systems which form so prominent a part of European, particularly of British, practice. The book under review is probably the most complete treatise of its kind which has been issued abroad, and, as reflecting the European situation, is of interest to the American reader. Its most valuable portion to the latter is its discussion of preventive methods other than by "milking." In this chapter the author says that roads on their own right of way have practically nothing to fear, and for city roads, where considerable leakage is apparent, recommends a well drained and consequently insulated roadbed, such, we presume, as would be supplied by track laid on gravel, cinders or concrete, and the exercise of care that the service pipes do not come too close to the rails. For the pipes themselves the author prefers cast iron, covered, where necessary, with pitch or some insulating paint, and laid with insulating joints. In some cases bonding between the pipes and the rails is advisable. Periodical reversal of the trolley potential is also recommended, but should be frequent. One writer quoted recommends once an hour.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED AUG. 21, 1906.

828,871. Apparatus for Preventing Collisions at Railway Crossings; Charles R. Barnes and Alfred Green, Rochester, N. Y. App. filed Nov. 12, 1903. Referred to in detail elsewhere in this issue of the STREET RAILWAY JOURNAL. A derailing plate is located in advance of the crossing and may be moved into operative relation by an electro-magnet automatically energized by a circuit closed by the movements of the semaphore arm.

828,879. Automatic Electric Brake; Augustus L. Duwelius, Cincinnati, Ohio. App. filed May 7, 1904. A small series generator is directly geared to the wheel axles and supplies current for a magnetic clutch through which the brakes are operated. This clutch, therefore, releases whenever the wheels stop revolving or "skid."

828,921. Pleasure Railway; Robert Buchanan, Jr., New York, N. Y. App. filed Feb. 9, 1906. A pair of trucks support a structure in the form of an animal, and a third rail is movable to depress a lever which sets the brakes.

828,939. Air Pressure Brake; Erwin Kramer, Berlin, Germany. App. filed Aug. 3, 1904. In order to avoid wheels skidding when brakes are applied, the patentee has a pressure cylinder for controlling the brake valve. This pressure cylinder is operated by a fluid circulatory system geared to the wheel axles.

828,957. Brake-Shoe; Albert Nelson, of Chicago Heights, Ill. App. filed Sept. 5, 1905. The brake-shoe has hardened steel cutter plates inset therein, which true up the wheels of the car whenever the brakes are applied.

828,980. Electric Circuit and Apparatus for Railway Signaling; Henry W. Spang, of New York, N. Y. App. filed Aug. 21, 1902. A circuit is arranged between the forward wheels and the rearward ones of a train, so that signals may be received when the train is passing over an insulated section of the track, the track being properly included in a transmitting circuit.

829,032. Power Brake; Louis Pfingst, of Boston, Mass. App. filed Nov. 4, 1904. Has a small motor directly geared to the brake-operating spindle, and means on the ordinary handle by which the motor or the hand lever are alone separately effective to set the brake, or by which both may be used together.

829,078. Adjustable Arm for Reversible Car Seat Backs; Robt.

L. Mangan, of Springfield, Mo. App. filed Oct. 2, 1905. The back of the car seat is mortised to receive a casting having an annular flange shaped to fit in the mortise. This casting has pivotal connections with the reversing arm of the seat.

829,109. Trolley Wheel Fork; Edward W. Keating, of Terre Haute, Ind. App. filed Feb. 3, 1906. The harp has upwardly projecting rollers swiveled thereto, which are capable of being spring-pressed in either direction when passing guy wires, etc.

829,132. Electric Semaphore; Jean F. Webb, of Denver, Col. App. filed June 25, 1906. Mechanical details of semaphore having a separate signal circuit operated by the movement of the arm to indicate that it has properly moved to danger position.

829,135. Motor Control System; Charles E. Bennett, of New York, N. Y. App. filed Dec. 28, 1905. In order to secure the advantages of a multiple-unit control system in a simple installation adapted to trolley cars, the patentee has a circuit-breaking magnet beneath the floor of the car which not only acts in case of overload, but also continually acts as a contactor, and removes arcing from the usual controller to a point beneath the car where it is not dangerous.

829,139. Single Pilot Wire Control System; Charles M. Clark, of Summit, N. J. App. filed May 16, 1906. A complete multiple-unit control system for trains operable over a single pilot wire. Relay magnets on the different cars are selectively operated simultaneously from the controller on any car.

829,142. Railway Traffic Controling System; Clarence W. Coleman, of Westfield, N. J. App. filed Feb. 15, 1904. The rails are charged to alternately potential difference and alternating-current magnets, on the principle of a constant current transformer are effective to close relay circuits for setting the danger and caution signals.

829,143. Air Brake System; Fred. D. Corey, of Schenectady, N. Y. App. filed Dec. 29, 1905. Has equalizing discharge valve by which only one engineer's valve on the train is operative at any given time.

829,151. Motor Starting Rheostat; John L. Hall and William C. Yates, of Schenectady, N. Y. App. filed Aug. 23, 1904. The contactors are initially moved by powerful magnetic coils, which are, however, automatically cut out of circuit as soon as the contactors have moved. The contactors are held in their closed relation by supplemental magnetic coils of less power.

829,152. Traveling Staircase; Edoard Lewis Hocquart, of Paris, France. App. filed June 6, 1905. The improvement mainly relates to a pair of anti-friction rolls which are situated beneath the grate-like platforms for the purpose of guiding the steps.

829,192. Electrical Signaling Device; Clinton M. Allen, of Bay City, Mich. App. filed Oct. 23, 1905. A system of wireless telegraphy adapted for train service. A wire is stretched along the track which serves as an antenna, and a ball on the locomotive serves as the receiving instrument.

829,221. Railway Brake; Aldis H. Marden, of Watertown, Mass. App. filed Jan. 19, 1906. The brake-shoe has a rearwardly projecting lug to engage the usual I-beam forming the brake support.

829,241. Railway Signal System; Robert O. Turner, of Barre, Vt. App. filed Feb. 5, 1906. A plurality of trolley conductors are stretched alongside of the track, and spring blades on the locomotive are effective to complete signaling circuits therewith.

829,256. Pleasure Railway; William J. Brown, of Pittsburg, Pa. App. filed Dec. 13, 1905. A form of Ferris wheel designed to roll along a horizontal track.

829,289. Car Fender; William Pickett, of West Lynn, Mass. App. filed July 29, 1905. The car fender is hinged in front of the car and has a notched wheel and detent by which it is kept in raised relation when desired.

829,309. Automatic Railway Block Signal; Harry M. Abernathy, of Cleveland, Ohio. App. filed Jan. 25, 1906. The semaphore signal is operated from a motor through a magnetic clutch.

829,342. Railway Signal; James Knight, of Philadelphia, Pa. App. filed Feb. 9, 1906. Mechanical details of semaphore operating mechanism actuated by pneumatic cylinders partially buried in the ground at the base of the semaphore.

829,347. Car Coupling; Adolph Moritz, of Montgomery, Ala. App. filed Jan. 13, 1905. Relates to improvements in the tail piece of the knuckle of an ordinary coupler head.

PERSONAL MENTION

MR. JOHN B. ROGERS, of San Francisco, has been elected vice-president and director of the United Railways of Portland, vice Mr. W. D. Larrabee, resigned.

PROF. W. E. GOLDSBOROUGH, of J. G. White & Company, was the commencement speaker this year at the Thomas S. Clarkson School of Technology at Potsdam, N. Y. The subject of Prof. Goldsborough's address was "Ambition."

MR. J. LESTER WOODBRIDGE, formerly engineer of the sales department of the Electric Storage Battery Company, of Philadelphia, has been appointed chief engineer of that company, succeeding Mr. J. B. Entz, who has resigned to accept the position of vice-president of the Electric Vehicle Company, of Hartford, Conn.

MR. WALTER C. KERR, of Westinghouse, Church, Kerr & Company, presented an interesting and powerful address on "Knowledge and Action" at the graduating exercises of the Staten Island Academy last June. The address has recently been reprinted by the academy and, like all of Mr. Kerr's addresses, presents a great deal of food for thought.

MR. H. J. DRESSEL, superintendent, and W. H. Reynaud, claim agent of the New Orleans Railway & Light Company, have returned from a visit to leading Northern cities, where they inspected and studied the electric transportation systems. Leaving New Orleans July 15, they went to Chicago, thence to Milwaukee, Minneapolis, St. Paul, Detroit, Cleveland, Buffalo, Niagara Falls, Indianapolis and Cincinnati.

MR. C. N. DUFFY, formerly secretary and treasurer of the Chicago City Railway Company, and Mr. H. C. Mackay, formerly comptroller of the Milwaukee Electric Railway & Light Company, were each recently presented by the American Street and Interurban Railway Accountants' Association with a sterling silver bowl, as a token of the appreciation of the association for their services while president and otherwise connected with accountants' association. This presentation was made to them under instructions of the executive committee of the accountants' association, and was due to the fact that both gentlemen had severed active connection with street railway work. The pieces were selected by President Brockway and were suitably inscribed.

INSPECTOR BEYER, of the Grosse Berliner Strassenbahn of Berlin, Germany, celebrated last month the twenty-fifth anniversary of the day when he ran the first electric tramway in the world. It was in the year 1881 that Herr Werner von Siemens, the founder of the German firm of Siemens & Halske, built the first electric street tramway from the Anhalt Railway station to Lichterfelde. Herr Beyer was the first man in charge of the new conveyance, uniting in his person the functions of motorman and conductor. He afterwards rose gradually to the post of chief inspector of the tramway system of that part of Berlin. Herr Beyer was made the recipient of some very valuable presents from his employers and from the members of the company's staff.

MR. JOHN DONNELLY has resigned his position as master mechanic of the Toronto Railway Company, of Toronto, Ont., which he has filled since April, 1905. Mr. Donnelly had an extensive experience in electric railway mechanical work prior to going to Toronto, having been master mechanic of the Indianapolis Traction & Terminal Company, of Indianapolis, Ind., and engaged in the mechanical department of the International Railway Company, of Buffalo, N. Y. While in Toronto he put the rolling stock in first-class shape and introduced a number of labor-saving devices and methods, some of which were described in the STREET RAILWAY JOURNAL for Feb. 14, 1906. Mr. Donnelly will make his headquarters in New York for the present.

MR. FRANK H. WAMPLER has been appointed master mechanic of the Cincinnati, Newport & Covington Light & Traction Company, with headquarters at Covington, Ky. Mr. Wampler has had wide experience in the mechanical department of electric railway work. For about twelve years he was master mechanic of the Philadelphia Rapid Transit Company, in charge of the Kensington Avenue shops, and prior to that time was for two years master mechanic of the Scranton Railway Company, at Scranton, Pa. He is also well known in connection with his work on the Intramural Railway at the Chicago World's Fair Exposition, having been sent to Chicago by the General Electric Company to assist in making the electric railway installation on the fair grounds.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit.

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O. Northern Ohio Tr. & Light Co	1 m., July '06	104,454	50,890	53,565	22,738	30,827
	1 " " '05	100,049	49,025	51,025	23,267	27,758
	7 " " '06	565,510	308,363	257,148	158,810	98,339
	7 " " '05	525,527	285,942	239,585	160,869	78,717
BINGHAMTON, N. Y. Binghamton Ry. Co.	1 m. July '06	32,468	13,664	18,804	7,725	11,079
	1 " " '05	31,612	13,602	18,009	7,282	10,728
BUFFALO, N. Y. International Ry. Co.	3 m., June '06	1,025,025	632,891	392,134	241,616	150,518
	3 " " '05	954,012	488,698	465,314	240,214	225,100
	6 " " '06	1,943,548	1,231,116	712,432	480,069	232,363
	6 " " '05	1,777,689	1,003,899	773,790	473,455	300,335
CHAMPAIGN, ILL. Illinois Traction Co.	1 m., July '06	262,545	136,125	126,420	------	------
	1 " " '05	207,253	108,541	98,712	------	------
	7 " " '06	1,624,373	911,118	713,255	------	------
	7 " " '05	1,317,135	725,400	591,735	------	------
CHARLESTON, S. C. Charleston Cons. Ry. Gas & Elec. Co.	1 m., July '06	61,727	34,564	27,163	13,017	14,147
	1 " " '05	58,363	31,523	26,841	13,167	13,674
	5 " " '06	272,214	162,708	109,506	64,933	44,573
	5 " " '05	254,917	148,216	106,701	65,083	41,618
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co.	1 m., June '06	113,155	60,043	53,112	24,939	28,173
	1 " '05	97,449	51,115	46,333	23,664	22,670
	3 " " '06	305,668	167,521	138,146	74,817	63,329
	3 " " '05	269,046	148,495	120,551	72,895	47,655
Chicago & Milwaukee Elec. R. R. Co.	1 m. July '06	97,425	33,485	63,939	------	------
	1 " '05	67,263	20,871	46,392	------	------
	7 " " '06	429,298	177,279	252,019	------	------
	7 " " 05	279,236	124,888	154,348	------	------
CLEVELAND, O. Cleveland, Painesville & Eastern R.R. Co.	1 m., July '06	32,631	*15,774	16,856	------	------
	1 " " '05	30,654	*14,585	16,068	------	------
	7 " " '06	146,518	*81,876	64,642	------	------
	7 " " '05	130,070	*77,732	52,338	------	------
Cleveland & Southwestern Traction Co.	1 m., July '06	64,136	32,790	31,346	------	------
	1 " " '05	54,823	28,304	26,519	------	------
	7 " " '06	353 413	205,950	147,463	------	------
	7 " " '05	292,198	177,196	115,002	------	------
Lake Shore Electric	1 m., June '06	75,980	*41,724	34,256	20,404	13,852
	1 " " '05	67,969	*37,443	30,526	20,404	10,122
	6 " " '06	376,188	*226 238	149,950	122,424	27,526
	6 " " '05	326,626	*198,131	128,495	122,424	6,071
DETROIT, MICH. Detroit United Ry.	1 m., July '06	564,603	*315,134	249,469	95,321	154,148
	1 " " '05	507,089	*285,682	221,407	89,891	131,516
	7 " " '06	3,242,940	*1924958	1,317,982	659,498	658,484
	7 " " '05	2,853,067	*1719706	1,133,361	643,815	489,546
DULUTH, MINN. Duluth St. Ry. Co.	1 m., June '06	66,999	29,266	37,734	17,534	20,200
	1 " " '05	55,456	28,376	27,081	16,826	10,255
	6 " " '06	356,238	191,475	164,762	105,053	59,709
	6 " " '05	304,742	167,465	137,277	100,579	36,698
EAST LIVERPOOL, O. East Liverpool Tr. & Lt. Co	1 m., July '06	33,132	16,784	16,348	8,274	8,074
	9 " '06	235,340	130,442	104,898	74,377	30,521
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co.	1 m., June '06	94,833	47,879	46,955	------	------
	1 " " '05	85,698	33,071	52,627	------	------
	6 " " '06	517,298	278,246	239 052	------	------
	6 " " '05	480,135	222,258	257,876	------	------
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.	1 m. June '06	98,289	61,926	36,363	------	------
	1 " " '05	85,500	53,242	32 258	------	------
	6 " " '06	497,248	312,452	184,795	------	------
	6 " " '05	426,159	267,504	158,655	------	------
FT. WORTH, TEX, Northern Texas Tr. Co	1 m., June '06	73,032	*45,398	27,634	9,942	17,692
	1 " " '05	67,849	*31,292	26,557	10,326	16,230
	12 " " '06	735,736	*454,365	281,371	119,275	162,096
	12 " " '05	608,356	*350,869	257,487	113,243	144,244
GALVESTON, TEX. Galveston Elec. Co	1 m., June '06	32,165	*16,411	15,754	4,167	11,587
	1 " " '05	25,195	*14,237	10,958	4,167	6,791
	6 " " '06	139,461	*90,559	48,902	25,000	23,902
	6 " " '05	121,169	------	------	------	------
GLOVERSVILLE, N. Y Fonda, Johnstown & Gloversville R.R. Co.	1 m., June '06	84,768	34,088	50,680	------	------
	1 " " '05	57,731	38,729	19,002	------	------
	12 " " '06	776,941	403,655	373 286	------	------
	12 " " '05	705,583	382,960	322,623	------	------
GREENSBURG, PA. Pittsburg, McKeesport & Greensburg Ry. Co.	1 m., July '06	26,615	10,767	15,848	------	------
	1 " " 05	22,423	11,129	11,294	------	------
	7 " " '06	123,098	------	------	------	------
	7 " " '05	100,328	------	------	------	------
HANCOCK, MICH. Houghton County St. Ry. Co	1 m., June '06	20 152	*11,752	8,400	3,918	4,482
	1 " " '05	14,634	*11,461	3,173	3,614	†441
	12 " " '06	211,196	*144,624	66,572	45,945	20,627
	12 " " '05	165,559	*161,528	4,030	41,685	†37,655
HEMPSTEAD, N. Y. N. Y. & Long Island Tr. Co	3 m. June, '06	58,601	30,043	28,558	14,403	14,155
	3 " " '05	40,670	26,210	14,460	5,547	8,913
	6 " " '06	98,508	54 701	43,807	28,153	15,654
	6 " " '05	55,786	38,564	17,222	6,117	11,105
HOUSTON, TEX. Houston Electric Co.	1 m., June '06	51,158	*30,138	21,021	7,692	13,329
	1 " " '05	44,854	*25,328	19,526	8,657	10,869
	12 " " '06	558,301	*346,646	211,655	100,366	111,289
	12 " " '05	429,571	*302,952	126,619	101,457	25,162
JAMAICA, N. Y. Long Island Elec. Co.	3 m., June '06	54,278	38,534	15,744	9,150	6,594
	3 " " '05	50,278	31,093	19,185	9,202	9,983
	6 " " '06	83,759	71 145	12,614	17,971	†5,357
	6 " " '05	74,797	57,259	17,538	18,538	†609
KANSAS CITY, MO. Kansas City Ry. & Lt. Co	1 m., June '06	457,788	245,102	212,686	142,026	70,660
	1 " '05	418 645	219,204	199,441	135,853	63,588
	12 " May '06	5,162,839	2,596,539	2,566 300	1,644,524	921,776
	12 " '05	4,465,722	2,235,260	2,230,462	1,501,862	728,600
LEECHBURG, PA. Pittsburg & Alleghany Valley Ry. Co.	1 m., July '06	4,368	2,923	1,445	------	------
	4 " " '06	19,366	11,018	8,348	7,770	579
MANILA, P. I. Manila Elec. R. R. & Lt. Co., Railway Dept	1 m. July '06	43,750	33,250	20,500	------	------
	7 " " '06	305,830	154,485	151,346	------	------
	1 " " 06	73,750	36,950	36,800	------	------
Total, all depts.	7 " " '06	513,785	259,378	254 409	------	------
MILWAUKEE, WIS. Milwaukee El. Ry. & Lt. Co.	1 m., July '06	305,681	146,817	158,864	90,191	68,673
	1 " " '05	277,203	126,959	150,243	78,577	71,666
	7 " " '06	1,977,341	987,029	990,312	604,596	385,716
	7 " " '05	1,828,895	909,395	919,500	529,326	390,174
Milwaukee Lt., Ht. & Tr. Co	1 m., July '06	81,679	26,784	54,895	30,709	24,186
	1 " " '05	70,659	24,115	46,543	23,863	22,680
	7 " " '06	374,920	149,830	225,090	176,671	48,419
	7 " " '05	327,483	146,481	181,002	141,773	39,229
MONTREAL, CAN. Montreal St. Ry. Co.	1 m., July '06	300,885	161,161	139,724	55 802	83,922
	1 " " '05	257,828	136,319	121,569	32,752	88,757
	10 " " '06	2,494,670	1,528,354	966,316	374,810	591,505
	10 " " '05	2,181,820	1 394,840	786,980	231,920	555 060
NEWBURGH, N. Y. Orange Co. Trac. Co.	1 m., June '06	13,030	8,043	4,987	------	------
	1 " " '05	12,102	7,466	4,636	------	------
	6 " " '06	56,928	42,836	14 092	------	------
	6 " " '05	51,118	39,117	12,001	------	------
NEW ORLEANS, LA. New Orleans Ry. & Lt. Co.	1 m July '06	443 831	264,685	179,146	161,450	17,696
	7 " " '06	3,342,919	1,805,153	1,537,766	1,077,736	460,030
PHILADELPHIA, PA. American Rys. Co.	1 m., July '06	275,676	------	------	------	------
	1 " " '05	254,836	------	------	------	------
ST. LOUIS, MO. United Railways Co. of St. Louis	1 m., July '06	794,220	*493,762	300,458	198,026	102,432
	1 " " '05	726,861	*451,674	275,187	198,840	76,347
	7 " " '06	5,194 488	*8218045	1,976,443	1 387,347	589,096
	7 " " '05	4,772,949	*3150853	1,622,096	1,394,177	227,919
SAVANNAH, GA. Savannah Electric Co.	1 m., June '06	58,224	*30,165	28,059	11,263	16,797
	1 " " '05	53,177	*29,939	23,239	10,554	12,684
	12 " " '06	614,780	*369,689	245,091	130,343	114,749
	12 " " 05	565,963	*326,391	239 572	127,070	112,502
TERRE HAUTE, IND. Terre Haute Tr. & Lt. Co	1 m., June '06	66,667	*35,847	30,819	13,776	17,043
	1 " " '05	55,543	*38,636	16,907	10,613	6,294
	12 " " '06	703,844	*434,450	269,395	140,850	128,545
	12 " " '05	596,447	*387,033	209,414	114,688	94,725
TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., June '06	178,110	*88 351	89,759	42 269	47,490
	1 " " '05	163,226	*80,846	82,380	41,771	40,609
	6 " " '06	962,502	*508,846	453,656	253 720	199,936
	6 " " '05	895,798	*463,736	432,057	253,815	178,242

Street Railway Journal

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Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 294,100 copies, an average of 8169 copies per week.

Telephones in Car Houses and Shops

That every operating car house on a street or interurban railway system needs a telephone admits of no discussion, for it is difficult to see how a road could be operated without means of instantaneous communication between the various power stations, offices, repair shops and car houses. The usefulness of the telephone within the shop or car house itself is another matter, however. It costs good money to rent telephones on the private branch exchange plan in a shop or office, and although rates on extension instruments are very reasonable in most cities, it is doubtful whether it pays to install such equipment in any but the largest and most important car houses and shops.

A local private telephone system, however, should be the means of saving a great deal of time in car houses and shops, just as in any industrial plant it is essential that all the departments should be connected by an interior telephone system to secure the most speedy despatch of business. In the car house it would be a convenience to have a small telephone set between the starter's office and the quarters of train crews awaiting trips on the road, and in cases where light repairs are made in the pits or on the floor, a telephone connection between the further end of the building and the office is most desirable. There is no great need of connection with the main system of the company or the city telephone lines, if the office is so connected, but in large shops and car houses the time saved by reducing the amount of moving to and fro by employees is well worth considering. Again, it is often difficult to locate an important executive official in case he is visiting different parts of the system. Sometimes business of great consequence comes up at the office during the absence of the manager, superintendent or other responsible executive, and if it were possible to bring him to the telephone promptly for due and sufficient cause, immediate and valuable results might be obtained without delay. Proper care to avoid needless calls on the part of subordinates would eliminate most of the abuses of such a system, and in ordering materials and supplies great convenience would certainly result. The cost of private telephones owned by the company, at say $5 per station, is a small matter in proportion to the benefits obtained. Doubtless such systems are needed more in shops than in car houses, but there is certainly a field for their practical use in the latter also.

Abandoning the Older Types of Motors

If more close investigations of the electrical efficiency and cost of repairs of the older types of railway motors were made, probably fewer of them would be kept in service. The question of abandonment of the older types of railway motors was brought up at the February meeting of the Street Railway Association of New York, and it was suggested that actual data regarding the cost of maintenance of different types of street railway motors be kept by operating companies with a view to finding out the advisability of discarding the older machines. Figures submitted at that time showed that the cost of maintaining some of the older types on one road was more than $3 per 1000 miles, while for some of the newer types which had been in service about four years the cost was $1.22 and $0.57, respectively, per 1000 miles. For some new motors which had not begun to deteriorate the cost for a period of six months was only 3 cents per 1000 miles. When a car makes in the neighborhood of 50,000 miles per year, the saving with such a difference in the cost of maintenance as that given would pay interest on the investment

required for new equipment, and there would still be a surplus left at the end of each year to liquidate the cost of the new motors.

The reliability of a motor might be said to vary inversely as the cost of maintenance. In other words, if shop cost records show heavy expense of maintenance for any one style of motors, other records will usually show that the motors of this type have caused a large number of "pull-ins" per 1000 miles. These "pull-ins" affect the profits of a company in more ways than one. In the first place, they cut down the revenue because they decrease the reliability of the service. In addition they occasion direct expense and cause more extra cars to be kept to take the place of those that fail.

Where the cost of maintenance is abnormally high, it is probable that the motors are overloaded, and in many instances this overloading is caused by operating the motors at a higher voltage than that for which they were intended. At the time of their manufacture a line pressure of 500 volts was found almost everywhere. Without any change in their windings these older types of motors are put under heavy cars and are operated at from 600 volts to 650 volts. Considerable overheating necessarily follows, and the armatures make repeated trips to the winding room. The bearings also give considerable trouble. On the greater number of lines on which these older types of motors are overworked due to high line voltages or heavier cars, it is not practicable to lower the schedule in order to reduce the load on the motors, and in the majority of such cases it would in all probability be wise to abandon the small motors and replace them with newer types of greater capacity. Further, if investigations were made as to the difference in the electrical efficiency of old and new types of motors under ordinary running conditions, this difference would no doubt be an item of considerable importance in favor of the abandonment of the older types.

While the keeping of detailed shop records necessitates the expenditure of a great deal of time, the suggestion to keep records on the cost of maintenance of the older types of motors in use seems to be a very good one. In many instances a definite knowledge of the proportion of general shop expenses caused by a few old types of motors would result in the relegation of these motors to the scrap heap or their exchange in partial payment for new equipments without delay.

Some Risks of Standardization

We have so often said a good word for standardization in equipment that it seems almost thankless to become critical in the matter, yet we cannot fail to see certain dangerous tendencies in ultra-conservatism. In mechanics as in politics there are times when it is best "to let well enough alone." But there can be no improvement in mechanisms or governments without breaking away from "well enough" and beginning to make changes in accepted standards. The case for progress was beautifully put by Mr. W. C. Kerr in a recent address, so apt that we cannot refrain from a quotation. "We hear rather too much about standards. They are all right in their way if they do not tend to crystallize error." There may be principles of mathematics and morals so finely and finally settled that they can be held as perfect and immutable guides to conduct, but in mechanics it is dangerous to assume perfection. The most one can be justified in doing is to hold to certain things as the best available for the time being. Just so soon as change ceases, there is an end to improvements. If the standardized form is good enough it will long persist; if not yet satisfactory it will inevitably be modified. The danger of standardization is in holding to things and methods clearly not the best in order to avoid the trouble of changing them. In manufacture the constant tendency is to standardize things not because they are thoroughly good but because they yield a larger profit when freed of the cost of improvement.

There is, however, another practical side to the question involving not changes of kind but changes of degree. If one looks back into the decades just ended one sees that the standards of yesterday are the scrap heap of to-day. Change in the art has compelled the replacement of apparatus before it has been worn out, and depreciation due to change in the art is a very large item in the valuation of a plant. Yet a point undoubtedly comes at which improvement ceases to pay if pushed too fast. In the long run a certain improved apparatus may save money, yet against that saving must be set the losses due to discarding the old one. And depreciation has been too generally neglected for the facts regarding it to come out at their true value. It is hard to remember it with respect to apparatus in hand, and harder still to see its bearing on the future. One does not buy a 6 per cent bond, with one year to run, at 110, unless he has quite lost his mind, but he may be hypnotized into buying a new device of doubtful durability at an enhanced price on the strength of increased returns. With modern railway equipments a point of good performance has been reached at which changes merely in degree must be sharply examined to make sure of their real economy. It is the changes in kind that may sometimes be of sensational value, but they may be compared to speculative investments which should be taken up only after the keenest scrutiny. There is then a genuine reason for some degree of conservatism, for caution in rejecting present standards and for a definite effort to determine such future standards as shall tend to avert needless and fanciful changes.

On the other hand, it is well known to those who have closely followed the progress of the art that so-called standards may represent two very different things—first, the general acceptance of certain things as upon the whole best suited to meet general conditions, or second the adoption of certain forms which later become obsolete from changes in the art. For the latter class there is little defense, since standards so inaugurated are a positive menace to future improvements. They may at the start represent a satisfactory development, but are certain to be held up long after improvements are due. The kind of standardization which is of real service is that which presses into convenient uniformity things which by proved usefulness have settled into approximately definite shape. In such cases the minor differences of dimensions and finish serve no useful purpose, not being essential to the use of the thing itself. They are, on the contrary, inconvenient either as preventing interchangeability or as producing needless variations in manufacture which cause disproportionate increase of cost. Fancy the endless annoyance which would ensue if nuts, bolts, screws and bits were made of irregular sizes, each maker having different standards. So far as standard dimensions and shapes can be used they should be used, the chief criterion

being that in determining these they should not be so regulated as to cause inconvenience in making improvements. One settles upon standard forms to simplify equipment, and not to complicate changes. Of the general equipment of a street railway system most of the important features can be standardized without in any way interfering with freedom of action in improvements. One must beware, however, lest dimensions, even, may unintentionally be fixed so as to discriminate against some future just as useful make of apparatus or other equipment. In so far as uniformity can be secured without checking the liberty of the individual inventor or preventing competition it is a blessing. In particular it enables street railway men by united action to put some pressure upon manufacturers so as to obtain a product upon the whole more suitable and obtainable at a standard low price.

Rail Corrugation

The subject of rail corrugation on electric railways still continues to attract considerable attention abroad, and further attention has recently been attracted to the lack of knowledge which we have on the subject, and which was commented upon in a recent editorial in the STREET RAILWAY JOURNAL. The new data on rail corrugation appear in a ponderous volume of 650 pages issued by the International Street and Interurban Railway Association in advance of its Milan meeting this month, and which contains answers prepared by the members of the association to questions submitted to them by the authors of the papers to be read at the meeting. One of these papers is on track construction, and one of the questions is whether rail corrugations have occurred on the lines owned by the member-companies, whether these corrugations occur at special locations or under all conditions, what the causes of the trouble are, so far as the companies have been able to determine them, and what remedies have been adopted. From the replies we find that out of seventy-eight roads, mostly city lines, comprising the principal roads in Continental Europe, forty-nine lines have suffered from this phenomenon and twenty-nine, mostly the smaller roads, have been practically free from it. All of the lines do not describe the character of the corrugations, but from those which submit this information we learn that the corrugations are about a millimeter (0.04 in.) in height and that they occur at intervals of from 1.4 ins. to 2.8 ins. apart. There are considerable differences, however, in the distance between the crests. Thus in Brussels 2.4 ins. is given as the minimum distance, whereas in Cologne it is reported as the maximum distance, while many companies give 1.4 ins. as the usual spacing of the corrugations. In Zurich a difference has been found in track laid on concrete and on broken stone ballast. In the former the distances apart are 1.76 ins. and in the latter 2.08 ins.

Coming now to the location of this peculiar kind of wear, we find all sorts of experience. Many of the roads do not state where the wear occurs, but among those that do give particulars we find a great variation. Thus, some roads say that it occurs only on the outer rail of curves, and attribute the trouble to the sliding of the wheels; others find it more common on straight track. One company has suffered only in its short-radius curves, another only in its long-radius curves, that is, in curves of over 320 ft. radius; still another has met the trouble only in curves of over 600 ft. radius where the outer rail was given no super-elevation. In Glasgow, Scotland, the greatest wear comes on the descending track in long-radius curves, and in Wurzburg on ascending curves. Many others find the trouble independent of the curvature. Two companies report corrugations only on their high-speed lines, another says that they occur in all lines, but more in the high-speed lines, still another said that they originally appeared only in the high-speed lines but now exist on all lines, even those where the cars run at only 5 miles per hour. Three others report that speed has nothing to do with the occurrence. The Brussels company has found considerable trouble where the pavement is loose about the rails. In Lyons corrugations occur principally where the rail is rigidly supported. Nuremberg and Cologne find them in both flexible and rigidly supported track. Grades seem to cause the trouble in Turin, but Stettin reports that it occurs both on grades and level track. One of the Parisian roads has had more trouble with rails rolled in 1900 than in the vintage of any other year. Zurich finds the trouble confined entirely to rails of one section; still another company states that on track seemingly alike the corrugations will appear for a short section and then will not be present for considerable distances on each side of the affected portion.

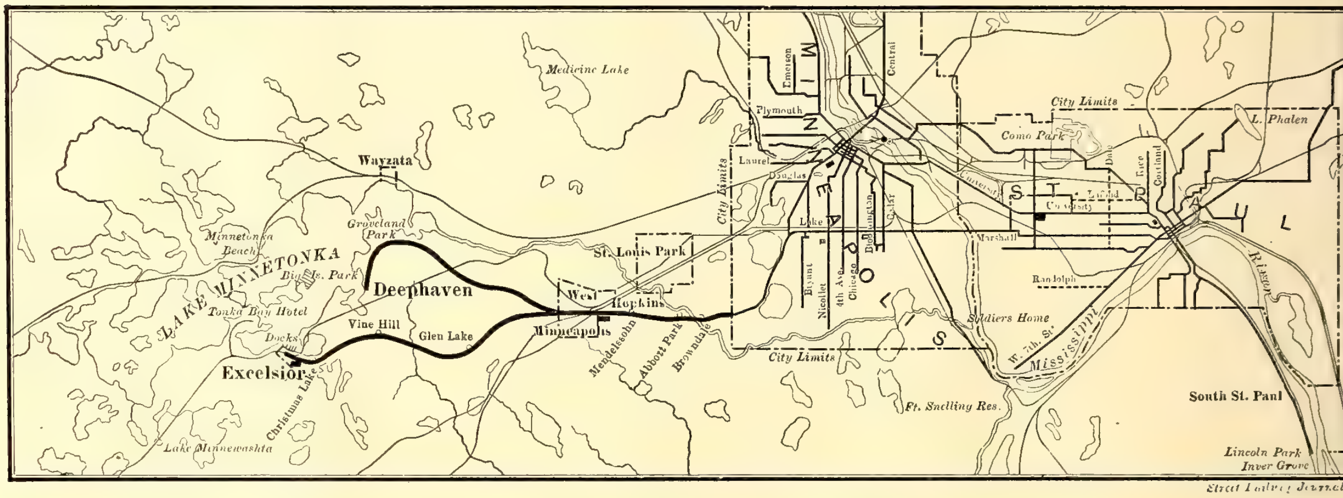
From this variety of evidence it is not surprising that there should be a large number of theories. The greatest number of roads favor the claim of defects in rolling, or lack of homogeneity in the metal. In all, nine companies attribute the trouble to this cause. Two companies think corrugations are caused by braking, three by harmonic vibration of the car springs, two by poor ballast and loosening of the rails, two by too great rigidity of the track, one by fatigue of the metal, one by the rolling out of the rails by the wheels, three by sliding of the wheels, three by lack of rhythmical driving of the gears, and three by softness of the rail or hardness of the wheels. Most of the companies, however, decline to be drawn into any theory as to the cause.

Very few of the companies have any remedy to suggest other than the temporary expedient of grinding down the high spots. This seems to be practiced by most of the companies which have suffered from this cause. The crests are either filed by hand or ground down by an emery wheel or by a special block carried on a car. Ghent and the Paris Eastern think that there is no remedy but the installation of a new rail, but Hamburg, after considerable filing but no other remedial measures, finds the corrugations are gradually disappearing by themselves. The companies which attribute the trouble to a too rigid support are introducing a more elastic roadbed by employing wooden blocks under the rails, as in Glasgow, or pads of felt or lead as in Lyons. Those which consider the trouble due to lack of support have installed extra long ties to anchor the rails to the soil, and in Brussels, where the corrugations were especially noticeable in low places in the tracks, steps have been taken to secure better drainage and to coat the joints with asphaltum so that water cannot assist in disintegrating the joints. In those roads where the corrugations have been most prominent on curves, steps have been taken to widen the gage at these points. As a whole, however, there seems to be no consensus of opinion as to the cause and remedy for this trouble.

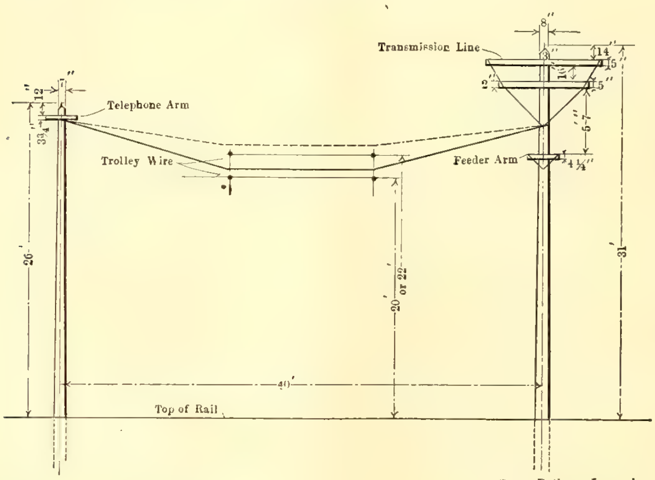
The matter has also received the attention of the Tramways and Light Railways Association, which represents the electric railway companies of Great Britain, and a discussion of the investigations made under the auspices of this body appears in a letter published in our Correspondence column this week.

THE DEVELOPMENT OF LAKE MINNETONKA BY THE TWIN CITY RAPID TRANSIT COMPANY

Lake Minnetonka, about 19 miles west of Minneapolis, is one of the largest and most picturesque of the many lakes in Minnesota. Although it has been for many years a favorite resort for people of Minneapolis and St. Paul and of the surrounding country, the fact that the transportation facilities were rather limited has prevented it obtaining the patronage that its bathing facilities, the opportunities it offers for fishing and boating, and the beauty of the surrounding country have deserved. Until the completion of a single-track electric line to Excelsior, on its south shore, last year by the Twin City Rapid Transit Company, the only means of reaching the lake was by the Great Northern Railway, which serves the north shore, and the Minneapolis & St. Louis Railroad and the Chicago, Milwaukee & St. Paul Railway Company, which reached several points on the south shore. As the shore line has a total length of 150 miles or more, the steam roads did not by any means reach all of the attractive points fronting on the water.



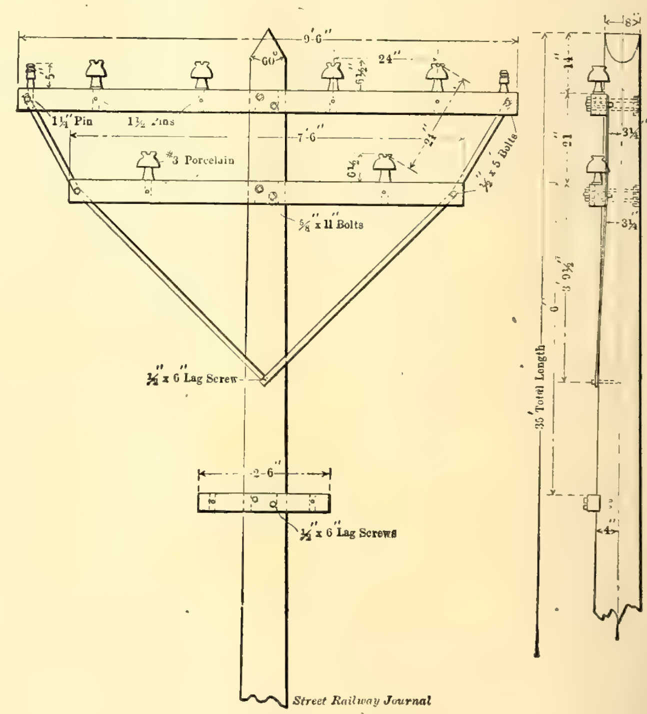
MAP OF TWIN CITY RAPID TRANSIT COMPANY'S SYSTEM, SHOWING THE NEW LAKE MINNETONKA LINE



DETAILS OF OVERHEAD WORK ON THE LAKE MINNETONKA LINE

During the past season the Twin City Rapid Transit Company has been making extensive preparations not only to handle heavy traffic to the lake, but also to give a ready means of access to all of the interesting points on the shore and to develop some of these points into pleasure resorts. Through the courtesy of Willard J. Hield, general manager of the company, this publication is enabled to present an account of these preparations, which include, in a general way, the double tracking of the single-track line to the lake, the construction of two fleets of steamers for service on the lake, and the development of a park on an island two miles from Excelsior, the terminus of the double-track line.

An idea of the patronage that will be given the lake by the people of Minneapolis and St. Paul may be judged from the fact that the railway company has made arrangements to operate cars over the line to Excelsior on a 2½-minute schedule. Some of the cars will be of the double-decked type built by the company especially for this service.



DETAILS OF STANDARD POLE CONSTRUCTION

To supply power for the heavy schedule contemplated, two sub-stations of unusually large capacity for interurban lines have been constructed, and the feeding of these sub-stations, together with the natural growth of the system and other extensions in turn, has necessitated additional generator capacity in the main generator station. In this there has just been installed a 3500-kw General Electric generator driven by an Allis-Chalmers vertical cross-compound engine, and there

are also being installed two 5000-kw Curtis steam turbines. The boiler capacity of the station has also been increased by the installation of six new boilers, each of 550-hp capacity.

HIGH-TENSION FEEDER SYSTEM

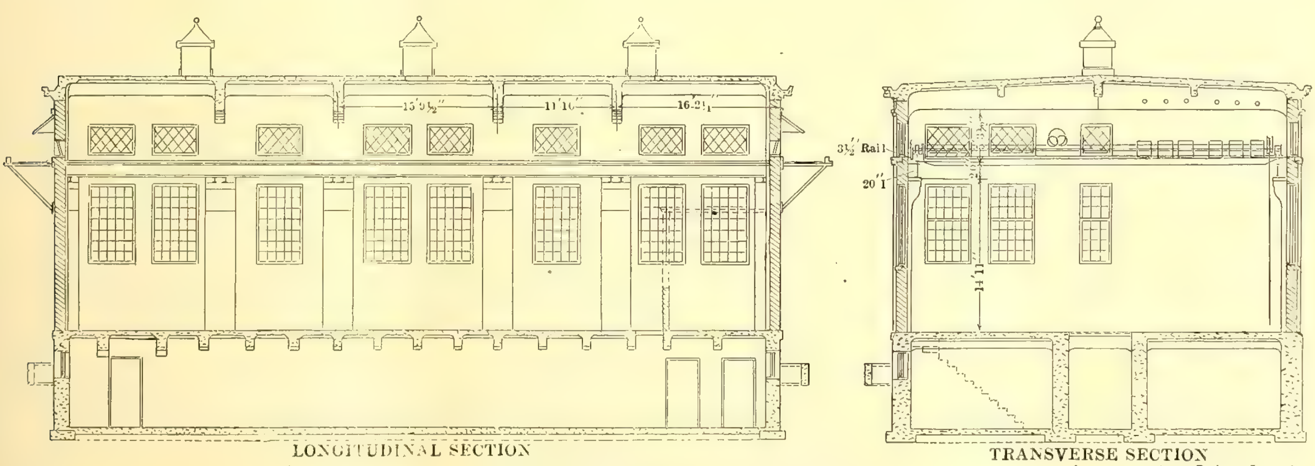
The high-tension feeder system to the two sub-stations on the Minnetonka division consists of two portions; that carried underground from the generating station to a point near the west limits of Minneapolis, and the overhead portion from this point to the sub-stations. One of the two three-conductor cables leaving the station contains a No. 0000 and the other a No. 0 three-phase line. Both are carried into the sub-station at Eleventh Street & Hennepin Avenue, Minneapolis, where switches are provided for connecting the conductors to the main high-tension buses of this sub-station. Leaving the sub-station the cables continue underground to a point near the city limits and about seven miles from the power house. Here they run up into the cable house shown in one of the accompanying illustrations, which contain lightning arresters, choke coils and disconnecting knife-switches. After emerging from the cable house, the high-tension lines are carried to the sub-stations at Hopkins and Excelsior on the poles supporting the span wires. These poles, which are 35 ft. in length and of cedar, support the six high-tension wires on two upper cross-arms in the manner shown in an accompanying drawing. Each of the cross-arms is secured to the posts by two ⅝-in. bolts extending clear through the post, and they are further held in place by braces bolted to the pole. On the ends of the upper cross-arm are placed ground wires which, instead of being continuous throughout the length of the line, are cut into sections, each one mile in length, each length being grounded near the middle. Erecting the ground wire in short lengths avoided the loop circuits which are present where the line is run continuously and grounded at several points.

A branch line from the high-tension system will be taken off the main line a short distance west of the Excelsior sub-station, and will be carried about two miles overhead and one-half mile under the lake in submarine cable to a sub-station of 600-kw capacity, located on Big Island. The sub-station will supply current for lighting the island, and will furnish power for operating the several amusement features of Big Island Park. A terminal containing lightning arresters will be constructed at the point where the line drops down into the submarine cable. The design and construction of the electrical features, the high-tension transmission system, as well as of the sub-stations, was under the immediate charge of E. H. Schofield, chief engineer of the company.

The sub-station buildings at West Minneapolis and Excelsior are practically of the same construction. The one at Excelsior is shown in an accompanying illustration. It is a concrete and brick structure, the walls being of brick and the floors and roof of concrete. Heavy reinforced concrete girders running across the building, with smaller wire girders extending between them, support the roof slabs. The slabs are covered with felt roofing material, and openings in

THE EXCELSIOR SUB-STATION

them over the middle of the building are provided with ventilators. The apparatus in the station is arranged after the general plan upon which several sub-stations have been constructed by the company. This plan places all of the alternating current apparatus on one side of the building, the rotary converters along the center line, while the direct current switchboard is on that side of the building opposite the alternating current apparatus. The high-tension lines enter the building and continue on through it, taps for feeding the station being brought down the wall underneath the entrance and through the disconnecting knife switches and lightning arresters mounted on the wall. Entrance of the high-tension wires into the building is made through Locke insulator tubes placed in slate panels, a drip roof of corrugated iron protecting the entrance. The high-tension wires pass through the building overhead and through the heavy concrete girders already mentioned as supporting the roof. Through these

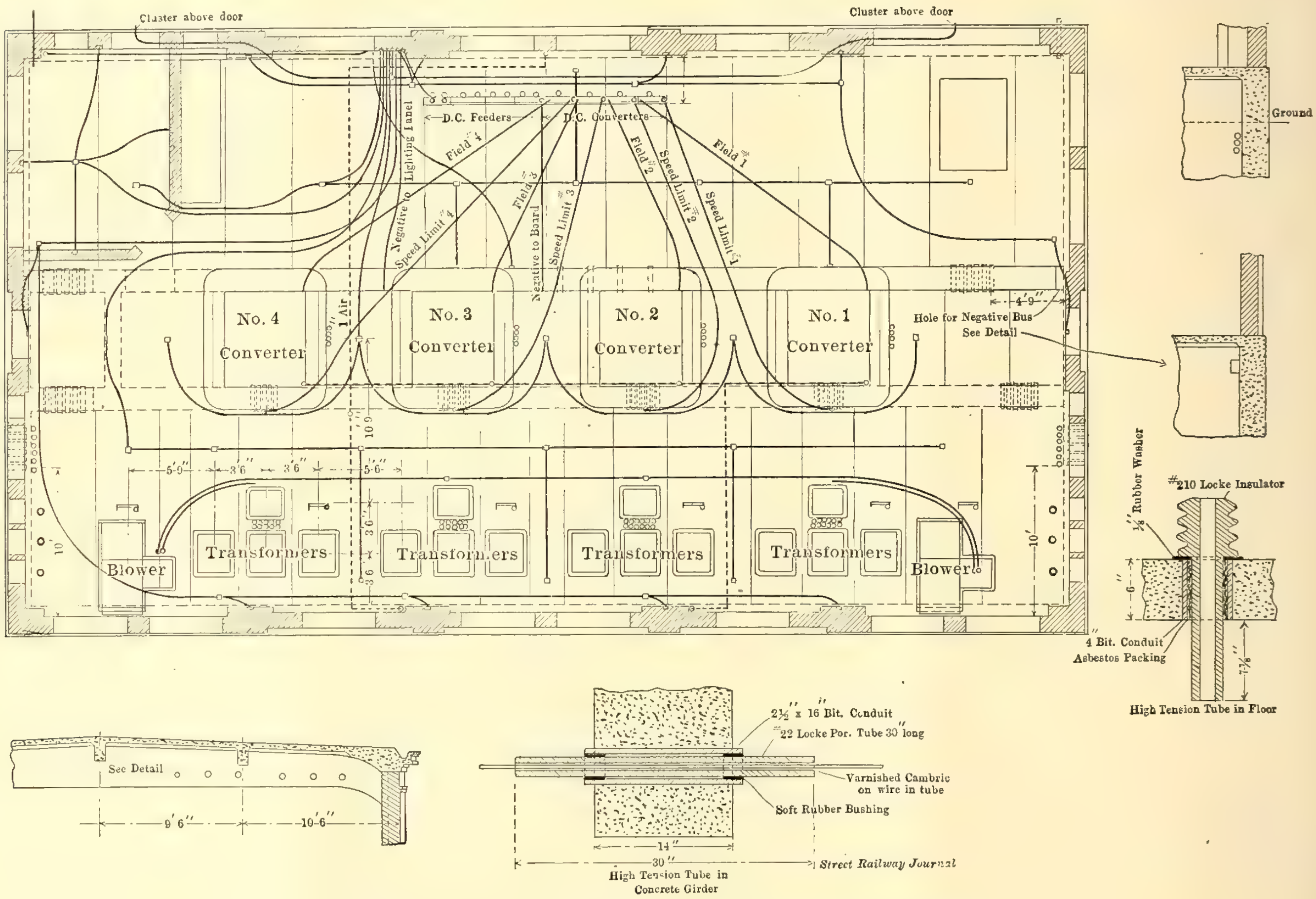


THE MINNETONKA SUB-STATION

girders the wires are carried in the manner shown in detail in one of the accompanying drawings. Into the girders, which are 14 ins. wide, is inserted a 2½-in. x 16-in. bituminized conduit tube, and inside this is supported by means of soft rubber bushings at each end of the tube a 30-in. Locke porcelain insulator tube which carries the bare wires. On passing through the arresters and switches already mentioned as being mounted on the wall, the high-tension cables drop through the floor to the basement, where connection is made to the high-tension buses by means of hand operated oil switches provided with automatic overload trips, both the switches and buses being located in the basement. Similar oil switches connect the buses to the step-down transformers immediately above on the main floor. The transformers are of the air-cooled type, a centrifugal fan being placed at each end of the row of transformers near the rear wall of the walls. Thence the two d. c. feeder cables are carried the full length of the road on cross-arms below those carrying the high-tension wires. While the station buildings are constructed for four 600-kw converters, only three of these are being installed at the present time.

THE TRACK AND OVERHEAD CONSTRUCTION

For about half the distance the single-track line to Excelsior was constructed on the abandoned grade of the old Minneapolis, Lyndale & Minnetonka Railway, which grade was cut down in places and filled in at other points when the electric line was built to secure a more uniform profile. The country traversed is rolling in character, and several heavy cuts and fills were necessary in the western end of the road, some of the fills being about 50 ft. high. At the bottom the cuts are 32 ft. wide, and at the top of the fills the banks are



PLAN AND OTHER DETAILS OF MINNETONKA SUB-STATION

building. It may be noted that the relative location of all the high-tension apparatus, the bus-bars, switches and transformers, is such as to necessitate the least amount of high-tension wiring, all of them being placed within a few feet of each other.

The foundations for all of the rotary converters consist of two parallel concrete walls in the basement running the full length of the building, the base of the converters bridging the two walls. No floor slabs are placed in the center of the converter frames, and the cables from the machines are carried down through these openings into the passageway between the two parallel walls serving as foundations for the converters. The openings in the floor under the machines not only prevent the accumulation of dirt, but also give better ventilation.

The direct current feeders from the switchboard are carried out of the building at a point just underneath the entering high-tension wires through porcelain tubes inserted in the 28 ft. across. Only two heavy overhead structures were required. One of them is the viaduct at Hopkins, where the line passes over the tracks of the Chicago, Milwaukee & St. Paul, the Minneapolis & St. Louis, and the Great Northern Railroads. This is of steel construction and was originally built for a single track, but a second viaduct has been built to accommodate the double-track line. In preparation for the heavy traffic, the electric railway tracks are carried over the tracks of the Minneapolis & St. Louis Railroad near Excelsior, and a steel girder bridge resting on concrete abutments, and shown in the course of construction in an accompanying illustration. Until June, 1906, the single-track line was at the steam-road grade and a short distance north of the new double-track route.

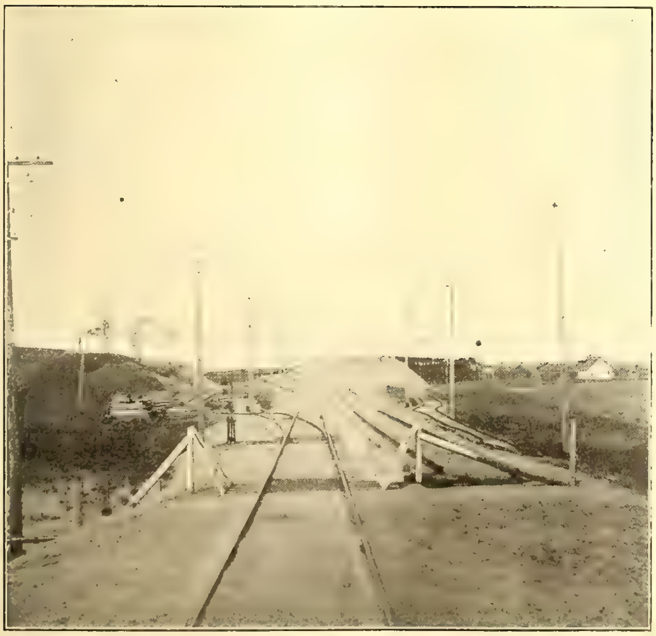
In addition to the double-track road to Excelsior, the lake may be reached by a single-track line, which, branching off from the main line at West Minneapolis (Hopkins), continues a distance of 7 miles to Deephaven, on the east shore

of the lake. This line, which was formerly operated as a steam road by the Chicago, Milwaukee & St. Paul Railway Company, has been equipped with a trolley. The only town of any consequence on the Minnetonka line is West Minneapolis, which is primarily a manufacturing center; and in

CONCRETE BRIDGE NEAR THE CITY LIMITS

addition to the through service to Excelsior a branch line has been built into West Minneapolis and a local service opened. Excelsior is now a small town of but a few hundred inhabitants during the winter months, but in view of the fact that through service will be put on to accommodate residents of Excelsior whose business is in Minneapolis, it will, no doubt, become the permanent home of many Minneapolis people.

The track construction, which is in charge of George L.



APPROACH TO VIADUCT AT HOPKINS, CROSSING THREE STEAM RAILROADS. VIEW TAKEN DURING LAYING OF SECOND TRACK

Wilson, engineer and roadmaster of the system, is being carried out much in accordance with steam railroad practice so far as grades, type of special work and heaviness of construction are concerned. The tracks are laid with 80-lb. rails bonded with 250,000-circ.-mil pin bonds on the main line, while soldered bonds have been used on the line to Deephaven. Gravel is found in large quantities at several points along the line, and this is employed as ballast. Practically all the curves are of sufficient radius to permit of full-speed operation of cars around them, and the most excessive grades are encountered at the approaches to the viaducts. The trolleys of No. 00 wire are supported 20 ft. above the rail. Quite an unusual feature in connection with the line will be the ar-

GIRDER BRIDGE ON THE LAKE MINNETONKA ROUTE

rangement for lighting it. Arc lights will be suspended from the span wires, ordinarily at intervals of about 300 ft., but on curves and at approaches to overhead bridges the distance

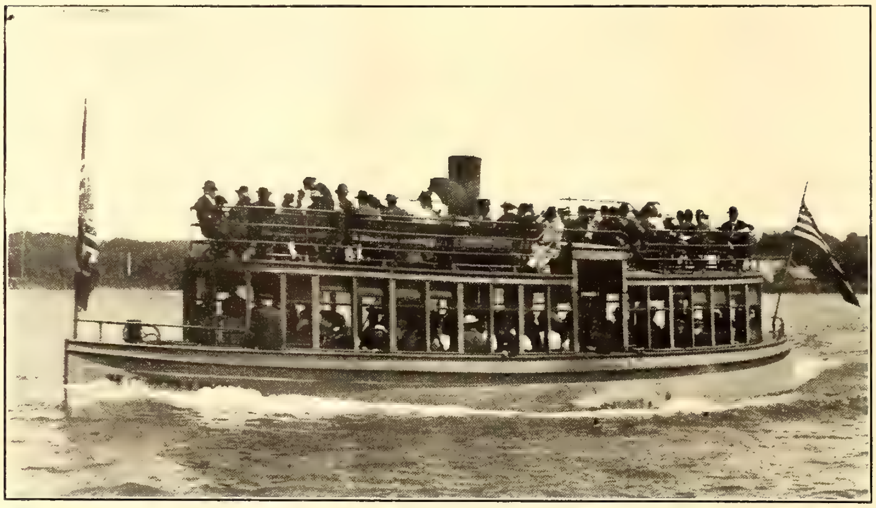
BRICK CABLE HOUSE NEAR CITY LIMITS

between the lamps will be much less. The lamps will be wired five in series and current will be taken from the trolley. A relay-system circuit-closing device will be employed to throw the lamps on the circuit, and this arrangement will avoid the necessity of men traveling the full length of the line to throw the lamps in. All of them will be placed on four independent circuits controlled by switches at the two sub-

stations. Throwing the sub-station switches will close the circuit through the first five lamps, and a relay in this circuit gives current to the five beyond. The action progresses on down the section in a similar manner.

BIG ISLAND PARK

While every portion of the shore line of the lake offers attractions to those seeking relief from the city, the main attraction at the end of the line other than the lake is the park now being developed on Big Island in the middle of the lake. The park, which contains about 60 acres, covers the east end of the island. It is high above the water, and consists of rolling land covered with elm and other natural forest trees. One section is being provided with roller coaster, mystic chutes, dancing pavilions, and similar amusement features, while another portion will be kept in its natural state. A feature of the park will be the open-air kitchens, equipped with stoves for the free use of picnic parties in making coffee or warming food. Facilities will be provided for bathing, and plans provide for an extensive concrete bathing pavilion.



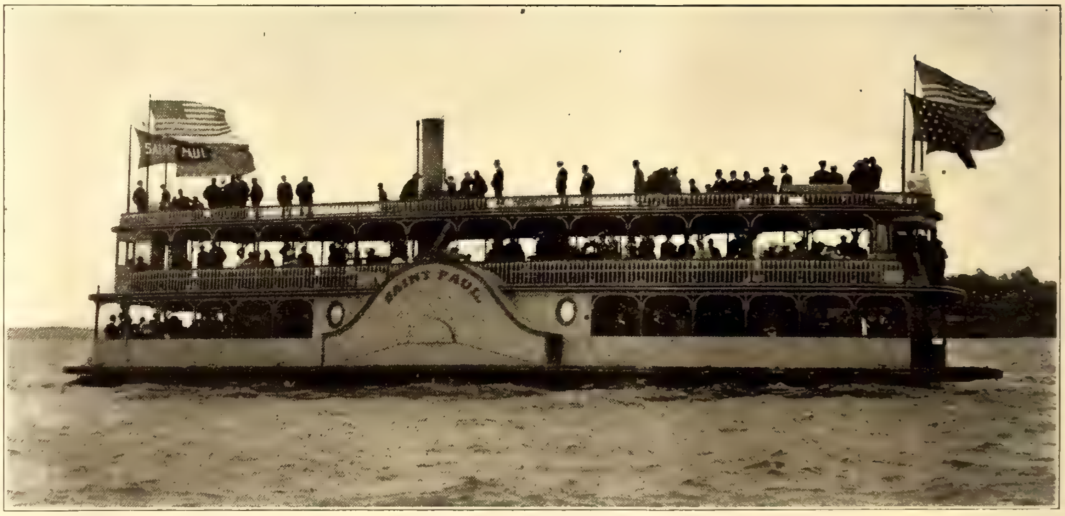
ONE OF THE SIX SMALL STEAMERS BUILT BY THE TWIN CITIES RAPID TRANSIT COMPANY

A complete water works system is being installed. Water from a deep well will be pumped by an electric driven pump which will obtain its power from the sub-station, to which previous reference has been made. This sub-station will be provided with a motor generator set for furnishing power to motors which drive the apparatus of the amusement features, and a three-phase alternating current system of distribution for lighting will be supplied with current from it. Arc lamps of the constant-current type will be employed in addition to the incandescent lamps.

THE LAKE STEAMERS

Mention has been made of the boats built for the company for service on the lake. Three of these, which were constructed out of doors on the lake near Deephaven, measure each 108 ft. x 35 ft. They are all built on the plan of the "Saint Paul," shown in an accompanying illustration. They have a capacity of 1,000 people, and are equipped with side wheels driven by separate engines.

The remaining six boats, which are of much smaller tonnage, were built in the shops of the company in Minneapolis. These smaller ones are termed express boats, and are for service between distant points on the lake, while the larger ones will ply only between Bib Island Park and Excelsior. The smaller boats are built with a torpedo stern, are 70 ft. long, and measure 15 ft. wide at the beam. Each has a total displacement of 60,000 lbs., and is equipped with a 44-in. propeller driven by a 150-hp triple-expansion condensing engine. A water-tube boiler, carrying steam at 250 lbs. pressure, is located a little forward of the center portion of the boat, and the engine is placed immediately behind it. As passengers are allowed in close proximity to the boiler, this has been well lagged to lessen the heat radiation. An asbestos covering is placed on the boiler plates, and an air space is allowed to intervene between this and an outer asbestos covering. The boat is lighted by electricity, current being obtained from a 10-hp De Laval steam turbine driven generator of 50-light capacity. This is placed in the machinery pit behind the boilers and near the engine. With the condensers, the boat contains 28,000 lbs. of machinery. Storage space is provided for six tons of coal. The boat is capable of making 15 miles per hour, and when fully loaded it draws 3½ ft. of water. Passengers are carried both in the cabin and on the upper deck or roof of the cabin. The upper deck is sheltered by a canvas top stretched on a steel framework. This covering not only protects passengers from the sun, but also shields them from the smoke and soot issuing from the smokestack. A stairway immediately in front of the boiler gives access to the upper deck.



ONE OF THE THREE LARGE STEAMERS BUILT FOR SERVICE BETWEEN BIG ISLAND PARK AND EXCELSIOR

Quite an unusual feature in a boat is the arrangement of the windows in the cabin. The design has been copied from street railway practice, and in fact the posts are identical in their general design with the posts of the cars of the Twin

City Rapid Transit Company. The lower sash drop into pockets underneath, and these pockets permit the sash to drop down below the floor line so that it is possible to place the arm rail down to within 27 inches from the floor. Entrance to the cabin is through a large door on either side of the boat, at the center. There were several objections to placing sliding doors at this point, and Kinnear rolling steel doors were employed. The cabin seats 65 passengers, while 70 people can be carried on the upper deck, giving a full capacity for the boat of 135. The ceiling of the cabin has a natural oak finish, while the sides are finished in cherry. The hull of the boat is painted a canary yellow and is trimmed a light olive. Aluminum striping is also employed. The finish of the hull is in fact identical with that employed on the cars. The six boats have been named after lakes in the vicinity of St. Paul and Minneapolis, including Lake Minnetonka, Como, Stillwater and Harriet.

OPERATING FEATURES

The despatcher's office for the new line is in the Excelsior terminal station. A cable of twelve pairs of telephone lines will be carried from the main office of the company to Excelsior and Big Island Park. A number of the lines will be used for despatching cars, while the remainder will be connected to the central switchboard at the main office and to telephones in several buildings in the park.

The one-way fare to Excelsior from Minneapolis is 25 cents. However, a twenty-five-ride commutation ticket may be purchased for $4.50, which is equivalent to 18 cents per ride. The commutation ticket includes not only fare to Excelsior, but in addition the fare on one of the express steamers to any point between Wayzata and Zumbra Heights, located respectively at the extreme east and west points of Lake Minnetonka. On trips to Minneapolis the fare includes a transfer to any local line.

CLEVELAND TRACTION SITUATION

For the time being at least Mayor Johnson has successfully forestalled the efforts of the Cleveland Electric Railway Company to bring the franchise extension matter to a popular vote, but in so doing has incurred the indignation of the thinking people of the city. The latest development grew out of the action of the Cleveland Electric Railway in relaying its track on Fulton Street which had been torn up by the city authorities. It will be remembered that this action was taken by the city several weeks ago, and in the injunction suit which followed the court held that the city had acted in an irregular manner and held that the track could be relaid in its old place in the center of the street. Acting under this order the old company asked for a permit to go to work. This was refused. The Mayor and Council committee threatened to arrest the officials of the company if they commenced work and to stop the cars on the lines where it was claimed franchises had expired. But the old company laid the track, and the threats were not carried out. Two days after the track had been laid in the center of the street the Council, having gone through the legal procedure of ordering the tracks moved to the side of the street, the old company changed over, at the same time asking for an injunction restraining the Forest City Company from laying any other tracks.

At the next Council meeting the old company attempted to get through its ordinance for a referendum vote of the people on the entire proposition. The Mayor worked the Council into a frenzy at what he characterized as the old company's defiance of the wishes of the Council, and as a result a vote was passed postponing indefinitely any action on propositions advanced by the company.

The offer of the Cleveland Electric on the referendum is a remarkably fair one. It offered to pay all the expenses of the election and to allow the Forest City Railway Company to place its proposition side by side with it on the ballot, each company setting forth its proposal in its own words.

The daily papers heretofore largely on the fence and if anything leaning toward the new company have come out strongly denouncing the Mayor for his obstruction policy. One of the papers had reporters interview several hundred pedestrians indiscriminately as to their views on the subject, and by an overwhelming majority the proposition of the Cleveland Electric was favored. Several of the Republican Councilmen have been making a house-to-house canvass of their constituents with the same results, while a postal card inquiry by another Councilman shows the sentiment favorable to the old company. The facts of the situation are that the remarkably fair proposition made by the old company and its skilful campaign of publicity, coupled with this latest development, are making it plain to the public that there is small chance of a speedy settlement of the controversy in the schemes advanced by the Mayor and his associates.

Several other matters of interest have transpired meanwhile. The Cleveland Electric has secured a twenty-five-year franchise for an extension of its system in the village of Collinwood, and a similar grant for a new line in the village of Cleveland Heights, and it has started to build both lines. For the latter it needs a grant from the city for an extension of a few hundred feet to make the connection, and although backed by the petition of all the property owners in the neighborhood for this little grant, it has small chance of getting it through the Council unless conditions change.

Both companies are endeavoring to secure the majority of consents on Gordon Avenue for a cross-town line, but the methods of operation differ. The officials of the Forest City Railway Company unblushingly admit that they are paying for consents and for revocations. While charged with doing the same thing, President Andrews of the Cleveland Electric has denied that one cent has been paid by his company or its representatives for either consents or revocations, and defies any one to prove the charges made.

Without giving the old company a chance at a hearing the Council committee met the other day and decided that the Forest City Company should pay the Cleveland Electric Railway Company $9,200 for the right to use certain of its tracks.

The Forest City Railway Company has leased from the city, at what is considered a very low figure, the old water-works pumping station for use as a power station. It is stated that temporary generating equipment has been arranged for to be delivered in the near future, and that a contract has been placed for two large units. The Cleveland Electric Railway Company offered to submit a very low proposition to supply the new company with power from its nearby Viaduct station, but the offer was disregarded. It is believed that Mayor Johnson proposes to install in the station equipment which will enable the "Municipal" company to supply the downtown section of the city with street lights, thus furthering the Mayor's schemes for more municipal lighting plants.

The Ft. Wayne & Wabash Valley Traction Company is hauling large quantities of wheat from the wheat fields along the line to the markets. This company and other electric railway lines which penetrate the agricultural districts of Indiana expect to capture considerable wheat business from the farmers this fall.

IMPORTANCE OF EFFECTIVE BRUSH-HOLDER INSPECTION

BY HENRY SCHLEGEL

Some time ago the writer had occasion to count off the set of the brushes on a number of railway motors; the conditions revealed by this incidental inspection were somewhat surprising. Out of thirty counts, only four were correct, and there was reason to suspect that this was purely a matter of accident. Of the remaining twenty-six, a few of the counts showed an error of as much as five bars, the majority of the others ranging from one bar to three. This condition of affairs did not seem to cause a panic to any one interested in the welfare of the motors, because, as was explained, there had never been serious trouble that could be traced with certainty to this source. This might have been so; for general electrical car troubles seem to have the ingenious faculty of leaving none of the marks that point to a particular cause; but the observation reminded the writer of a particular management that attributed all of its troubles to severe lightning storms, when as a matter of fact lightning neither bends armature shafts nor lets armatures down on the pole pieces, that is, so far as he has been able to ascertain. General electrical car troubles are, no doubt, due to general and conspiring causes, but it is a significant fact that overhauling of brush holders has in several recent cases known to the writer greatly decreased many ailments acknowledged to be incident to sparking. This should justify the belief that improper setting of the brushes might be considered as at least one of the causes of general car troubles; and suggests that it might be interesting to consider the degree to which the brush holder may be responsible for the improper setting of the brushes. Such a consideration may not include troubles due to weak brush-holder springs, tight brushes and other irregularities incident to careless or ignorant inspection, but it may be profitably confined simply to the functions required of the brush holder itself and to a brief consideration of wherein these may be overlooked in actual practice.

The function of a brush holder is not only to hold the brushes a distance apart represented by one-quarter of the circumference of the commutator, in the case of a four-pole street railway motor, but also so to support the brushes that they shall be at equal circumferential distances on the two sides of a vertical line passing through the center of the commutator when the motor rests absolutely level; only when this latter condition is fulfilled will the armature give as satisfactory performance in one direction of rotation as in the other, that is, from the point of view of sparking. Thus in Fig. 1, xy is a vertical line through the center of the armature when the motor rests level. Here not only must the number of commutator bars included between brushes a and b from center to center be one-quarter of the total number of bars in the commutator, but the number of bars from the center of brush a to line xy must be the same as that from the center of brush b to the line xy. In some cases an error in the setting of the brushes has been due to the count being taken between the inside edges of the brushes. It is all right to take the count between inside edges because it is difficult to locate the bar under the center of brushes, but in doing so due allowance must be made for the thickness of two half brushes. For example, if a commutator has 99 bars, the number of bars to be included between brush centers is, $99 \div 4 = 24\frac{3}{4}$ bars; if the thickness of a brush is such that the brush covers $1\frac{3}{4}$ bars, the number of bars to be counted off between inside edges of brushes is, $24\frac{3}{4} - 1\frac{3}{4} = 23$ bars.

It is an easy matter to have the two brush holders so disposed as to space the brushes the correct number of bars apart, but to have one holder further from the vertical center line than the other, that is to say, the two holders as a whole are too far to one side or the other. This condition is indicated in Fig. 2, where a and b represent the brushes in their correct positions, and e and d where they have been forced bodily to the right. Such a condition may be due to too much clearance in the holes through which pass the stud bolts that secure the brush holder yoke to the motor frame; or it may be due to error in the horizontal alignment of the brush yoke owing to the alignment having been taken without adopting the precaution to have the motor level before doing so. That is, the yoke may be level in regard to the earth but not level in regard to the motor, thereby throwing the vertical center line from which the count is made to one side or the other of the highest point on the commutator. When the motor is perfectly level the point that is midway between the two holders will be the highest point on the commutator, unless, for special reasons, both holders have been thrown to one side or the other to facilitate inspection. Ordinarily the commutator covers of railway motors set in a horizontal plane, and irrespective of whether the motor poles may be on horizontal and vertical diameters or on diagonal diameters the

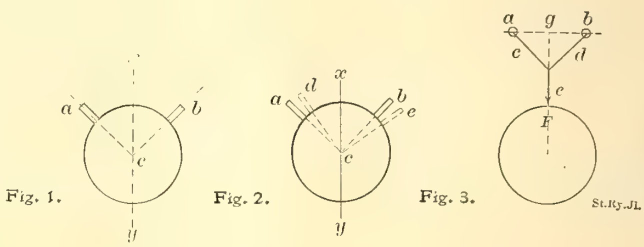


Fig. 1. Fig. 2. Fig. 3.

leads of the armature coils are such that the non-sparking points of the brushes are in positions where an inspector can most conveniently reach the brushes for inspection and renewal. In such cases inspection is made through trap doors in the car floor. On a few of the more recent heavy types of railway motor, the commutator cover has been placed at an angle to admit of inspection and brush renewal from beneath the car. In this case the two holders are not at equal distances on either side of the vertical center line, but are at equal distances on either side of a line making a certain angle with the vertical center line. In either case the two holders must be located symmetrically in regard to the line; and the commutator bar that such a line would cut, which bar is the one from which the count is made in both directions, may be obtained by means of a templet so constructed as to engage simultaneously the centers of the brush holder stud holes in the motor frame and the surface of the commutator. Fig. 3 indicates the principle on which such a templet might be constructed. Here a and b represent the brush holder stud holes in the motor frame, and F the commutator; cde is a rigid forked steel construction such that when legs c and d are seated in holes a and b, the pointer e will rest on the commutator bar intersected by an imaginary line, ge, passing midway between a and b and projecting at right angles to line ab. This is the bar from which both holders must be equidistant. The practical result of having the holder set over bodily is to have the brushes spark for one direction of rotation but not for the other. This condition has suggested the practicability of providing railway lines with loops, to avoid the necessity of operating the cars from both ends, and hence the motors, at high speed in both directions, and setting the brush yoke back against the direction of normal rotation to minimize sparking in regular operation. In such a case, to avoid excessive sparking at such a time as

it may be necessary to operate the car in the reverse direction, the controller and reverse drum are so interlocked as to prevent moving the controller drum past the last series notch when the reverse drum is in the reverse position.

Troubles incident to irregularities in the brush gear may be due to any or all of three causes: Faulty construction of the metal part of the holder; shrinkage of the wooden yoke caused by the heat of service; faulty construction of the yoke itself. The metal holders obtained from the factory are, with rare exceptions, to be depended on; trouble with such parts generally begins when a street railway repair shop undertakes to make its own holders and continues until due experience, often a sad and expensive one, begets a proper knowledge of the shrinkages to be allowed in the matter of casting. There are cases innumerable where an old brush holder has been smoothed up, its correctness insured and the holder then used as a pattern from which to cast new holders: result, new holders short in all dimensions. Where a holder is used as a pattern, error is almost unavoidable. Where the new holders are to be cast from a wooden pattern the dimensions of which are taken from an old holder, only one shrinkage must be allowed; that is, the dimensions of the pattern must be made sufficiently larger than the dimensions of the sample holder so that after the casting has shrunk on cooling its dimensions will be the same as those of the sample holder. In cases where the new brush holders are to be made from a metal pattern, double shrinkage must be allowed in taking the dimensions from the sample holder, because the metal pattern will shrink on cooling, and so will the new holders made from it. The effect of error or indifference in allowing for shrinkage is most strongly felt on holders that have an overhanging arm such as a in Fig. 4, where if the arm is too long the holder will space the brushes too close together, and it the arm is too short it will space them too far apart. In other types of holder error may result in the holder rubbing the head of the commutator or in brushes hanging over the end of the commutator, as indicated in Fig. 5.

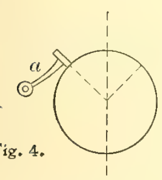


Fig. 4.

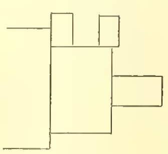


Fig. 5.

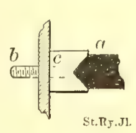


Fig. 6.

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The second named source of trouble, shrinkage of brush yoke due to the heat of service, is one that has given a deal of trouble in its time and gives some trouble yet. The main cause is to be found in the use of wood that is not properly seasoned. The result of shrinkage due to heat may be to loosen the brush-holder fastenings, or simply to skew the holder out of shape, thereby pulling the brushes out of set; in either case the final result is a flash-over. Shrinkage of a yoke can only be detected in time by periodically testing the set of the brushes. Yokes have been known to shrink sufficiently to bring the brushes three bars closer together than they should be and without loosening the holder fastenings.

On motors that do not employ a yoke, but support the holders on wooden blocks the axes of which are parallel to the armature shaft, the equivalent of yoke shrinkage may be obtained by carelessness in babbitting the seats that support the construction as a whole. On such motors tightening of the brush-holder stud generally draws a V-shaped end on the holder down into a V-shaped guide on the motor frame as indicated in Fig. 6, where a is the holder, b the stud, and c the V-shaped guide on the frame. If the holder is correct, and there is no foreign matter between the holder and guide, the V construction insures that the brushes will rest parallel to the commutator and that the two sets will include the correct number of bars between them. Irregularity in any of the factors named, however, will introduce error equivalent to shrinking of the yoke on a yoke type of holder.

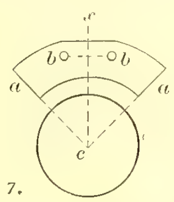


Fig. 7.

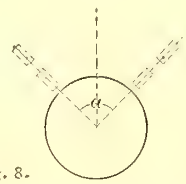


Fig. 8.

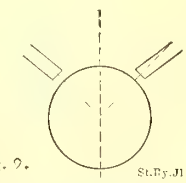


Fig. 9.

St.Ry.Jl

The third source of error, wrong construction of brush yoke, has given, is giving, and probably will give more trouble than all other causes put together, because apparently it is a very simple matter to get the yokes correctly made, while really such a condition is the exception rather than the rule. Factory-made yokes are generally correct, but they are not always so. Errors will creep in notwithstanding the care and precautions taken to keep the templets, gages and jigs up to standard, and such errors should be checked on each lot of new holders received. The principal field for error, however, lies in the home-made yoke constructed by mechanics who do not really know what a brush holder is required to do and keep doing. The following discussion may throw some light on the matter. Fig. 7 indicates a simple form of yoke; a is a wooden board in which two holes b are bored to take the studs that fasten the yoke to the motor frame. Sides a receive the metal guides in which the holders proper slide to and from the center of the commutator to allow for wear in the commutator. The angles of the two sides are equal and they must be such that the imaginary center lines passing through the axes of the brushes may always pass through the center of the commutator. Fig. 8 shows that when this condition is fulfilled the brushes will always include the correct number of bars between them (provided they do in the first place), because as the commutator wears down the commutator bars get proportionally thinner; in other words, the circumferential distance between the centers of the brushes will always include one-quarter the total number of bars in the commutator. Brushes that fulfil this condition are radial brushes. Fig. 9 illustrates a type of brush holder that is radial in action, in that the contact surface on the commutator must move toward the center of the commutator as wear takes place, but the set of an individual brush is not radial, because the center lines passing through the axes of the brushes do not meet at any point representing the center of the commutator—the only condition under which the number of commutator bars included will remain the same throughout the wear of the commutator. In such a case, either the guides in which the holders slide must be so disposed that the brush contact surfaces must move at right angles to a line connecting their centers to the center of the commutator, or a vertical adjustment must be provided to admit of dropping the holders in a vertical direction as wear takes place. In any case, if the bearing surfaces move inward along any other line than the line passing between the center of the commutator and the centers of the bearing surfaces and at right angles to the bearing surfaces, the setting of the brushes will become untrue as wear obtains. Fig. 10 represents an exaggerated case where the angle between the brush-holder guides is less than a right angle. In this case, as wear takes place the brushes get further and further apart, the number of bars between them of course increasing. Fig. 11 represents an exaggerated case where the angle between the brush-holder guides is greater than a right angle. In this case, as wear takes place the brushes get closer and closer together, the

number of bars between them, of course, decreasing. These two possibilities should impress one with the necessity of carefully inspecting all brush yokes, not only to see that the surfaces on which the guides are to be mounted make the correct angle with each other, but to see that the point of intersection of the axes of the guides meet at the correct point. In the case of radial brush holders, the angle that the guide axes should make with each other is a right angle, and their correct point of intersection is the center of the commutator. In the case of holders that take brushes the bearing surface of which is greater than the cross-section of the brush, as in

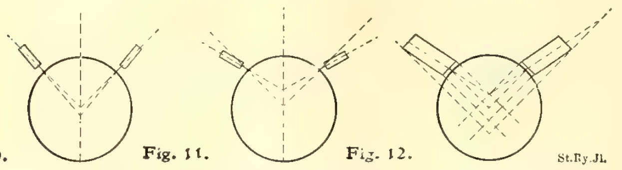


Fig. 10. Fig. 11. Fig. 12. St.Ry.Jl.

Fig. 9, the angle of the guide axes will be a right angle, but the point of intersection will be at a point vertically under the center of the commutator. Fig. 11 indicates the intersection of the axes of brushes that are truly radial. Fig. 12 indicates the intersection of the axes of brushes the bearing surface of which is greater than the cross-section of the brush. In the first case the brush axes and the axes of the holders coincide; in the second case the brush axes meet at a point way above the center of the commutator, and in order that the axes through the bearing surfaces shall move rapidly the axes of the holders must meet at a point considerably below the center of the commutator, and the exact location of this point depends on the amount by which the brushes are inclined from the radial direction. In the case of truly radial brushes, where the axes meet at the center of the commutator, as indicated in Fig. 7, care must be taken that surfaces x and y are not only at right angles to each other, but that they are so disposed that the axes of the brushes will meet at point c, the center of the commutator. Fig. 13 indicates an exaggerated case where the surfaces are at right angles to each other, but which have been so finished that the axes do not meet at the center.

Fortunately the correct construction of the yoke can be insured in all cases by the use of a comparatively simple jig, the principle of construction and application of which is indicated in Fig. 14. Here A represents a wooden cylinder finished to two sizes on the end. The larger size corresponds to the diameter of a new commutator and the smaller size to the diameter of a commutator that has worn as small as they are going to be allowed to wear. Points a and b represent the points of support of the yoke to the motor frame. Distances ax, bx and xy are carefully taken from an actual motor of the type in question. Cylinder A then has the same relation to a finished holder supported at a and b that it would have were it installed in the motor in place of the armature. Points c and d are marked off on either side of vertical line xy at a distance representing exactly one-eighth the circumference of the commutator when new; points c' and d' are points marked on the smaller cylinder and on the same radii that pass through c and d, and they represent the bearing points of the brushes on a worn commutator. To test a finished holder, it is supported at a and b; when the holder is in line with the large part of the cylinder and brushes are inserted, the centers of the brushes should coincide with marks c and d respectively; if they do not, some part of the yoke or holder is wrong. Assuming that they do, the cylinder is then shoved back until the holders register with the smaller part of the cylinder. The holders are then run in radially in their guides and the brushes once more inserted. Again, the centers of the brushes should coincide with the marks c' and d'. Assuming that they do, the holder and yoke constructions may be considered as correct. Assuming that they do not, there is an error somewhere, and it must be located before allowing the device to pass inspection. In either case it will not do to test the setting by simply allowing the brushes to feed from the larger cylinder down into the smaller one, because the clearance between the brushes and holders is sufficient to give misleading results; the guides are being primarily tested and not the trueness with which the brushes feed along the containing holder. The trueness of the containing part of the holder should be tested separately by allowing the brushes to feed from the larger cylinder down onto the smaller one without moving the holders.

Another important point that inspection will often show to be very much neglected is the distance of the holder from the commutator. A new armature is installed, and should it be fortunate enough to outlast the wear of its commutator, it will probably do so without its holder ever being run in radially to take up the wear. The most frequent field for this trouble, however, is where an armature with a worn commutator is installed in place of one having a large commutator. Brushes give the best satisfaction when the holders are run in as close as they can be with safety. The brushes then chatter less, are less liable to break, and show minimum tendency to develop two wearing surfaces at angles with each other; also, if the distance is great and the brush is comparatively loose in the holder, the set of the brushes when the car runs in one direction is likely to be different from what it is in the other direction. By all means, then, adjust the holders to suit the size of the commutator.

Another important but often ignored condition necessary to the successful operation of brush holders is to gage the containing part of the holder and maintain the containing parts at standard size. This precaution applies especially to home-made holders, usually finished with a file regardless of whether they may fit a standard plug gage or not. To get the full benefit of this precaution, however, the brushes should be tested with a gage. Some brushes will be thicker than others and some brushes will be thicker on one end than on the other. The result of the first condition is that the brushes fit the holders with varying degrees of clearance: one brush

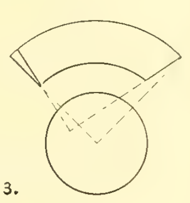


Fig. 13.

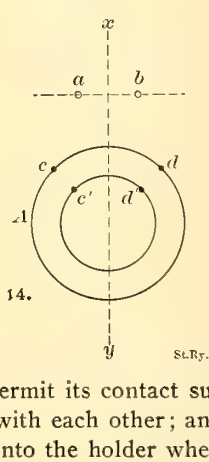
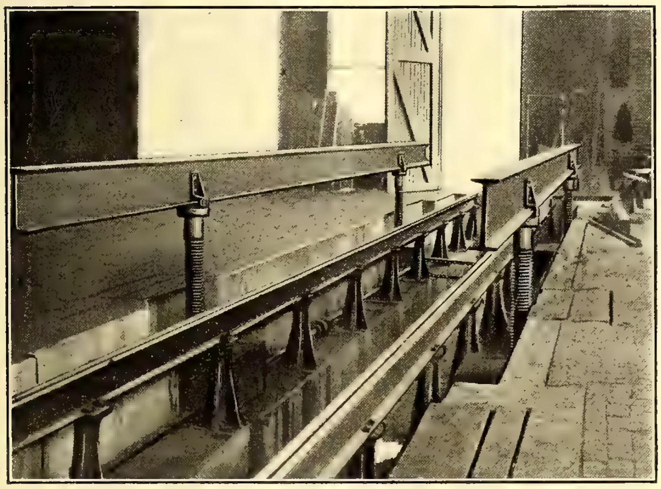


Fig. 14. St.Ry.Jl.

may be so loose as to wobble and permit its contact surface to wear into two surfaces at angles with each other; another may be sufficiently loose to just go into the holder when the holder is warm and the brush is cold, only to stick and cause a flashover as soon as the brush expands from the heat. The result of the second condition is that the brush may enter the holder easily when presented thin end first, but as soon as wear permits the thicker part to enter, there results a wedging action which will ultimately cause a flashover. Where brushes are not subjected to the gage test the only way to avoid the troubles incident to lack of uniformity in thickness is to try every brush end for end before installing it perma-

nently in the holder. The only way to avoid the bad effects of non-uniformity in brushes and in the containing parts of holders is to have all brushes and holders gaged before being allowed to leave the store room. Finally, if a brush is too large, neither the brush nor the holder should be changed until a test determines which is at fault. If a holder that is already sufficiently large be made larger, all brushes of standard size will have too much clearance; and if a brush is for any reason sandpapered to make a fit, the result is to remove the copper film that is provided to improve the conductivity of the contact between the brush and holder; the removal of this film is apt to make the brush run hotter than it should.



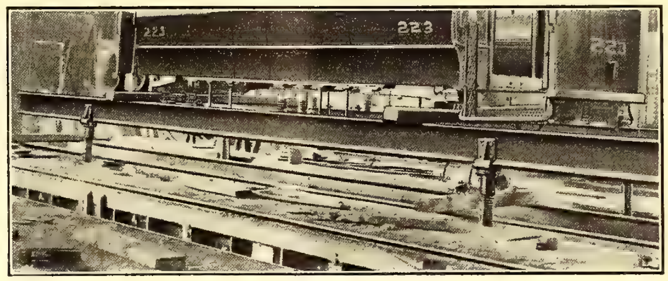
GENERAL VIEW OF CAR-LIFTING DEVICE AT ARABELLA CAR HOUSE, NEW ORLEANS

Proper care of brushes and holders will forestall and prevent many of the troubles that are ordinarily listed as unaccountable.

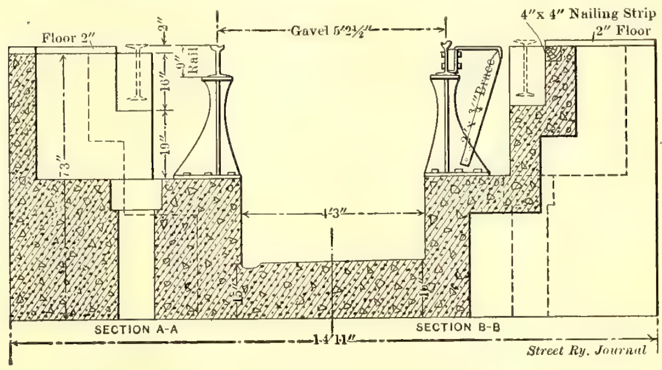
On the recently opened railway between Viborg and Herning, in Finland, Denmark, belonging to the Danish State Railways, women are for the first time employed exclusively as station masters. These women, whose position is denoted by a special ribbon worn on the right arm, are the wives of the track foremen, of whom there is one to each station. When a "station master" dies the husband is bound to marry again within a reasonable time, the new wife becoming in turn station master.

CAR HOIST AT NEW ORLEANS

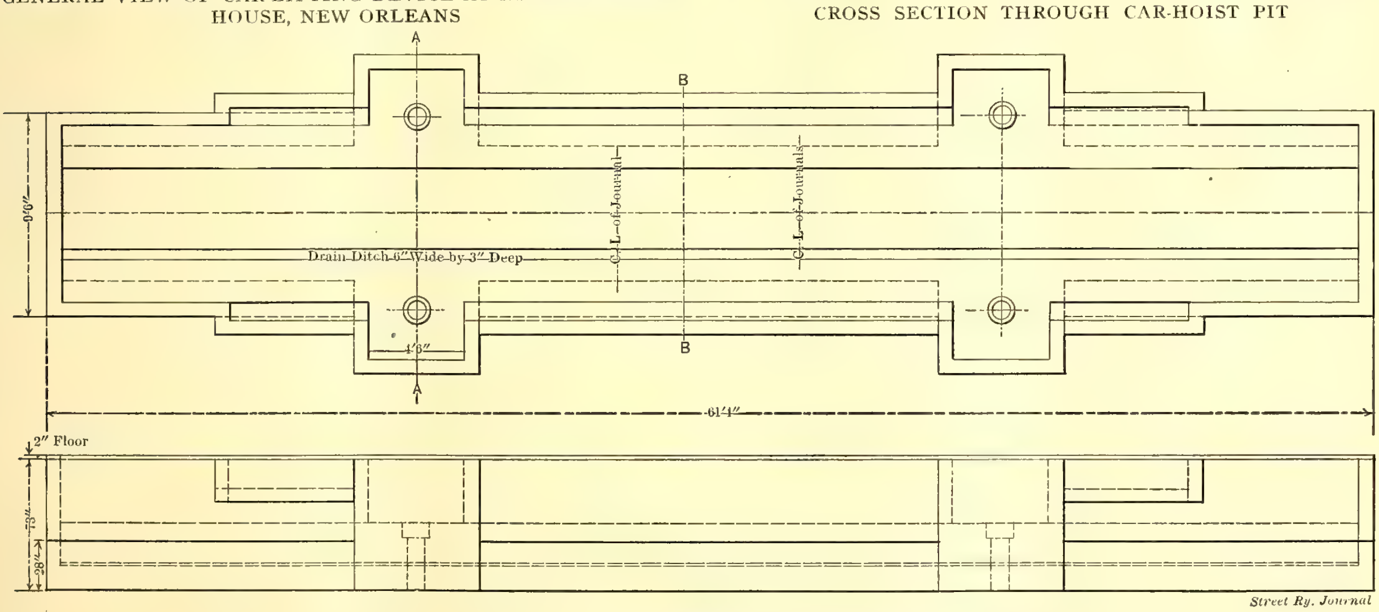
The New Orleans Railway & Light Company has for some time used with satisfaction at its Arabella car house the form of car hoist shown in the accompanying engravings. The hoist consists of two I-beams supported on four jacks (two



CAR-BODY WEIGHING TWELVE TONS PARTLY RAISED ON JACK LIFT, ARABELLA CAR HOUSE, NEW ORLEANS



CROSS SECTION THROUGH CAR-HOIST PIT



PLAN OF CAR-HOIST PIT, ARABELLA CAR HOUSE, NEW ORLEANS

right-hand and two left-hand), which are operated by worm gears. The motive power is supplied by a GE-800 motor mounted in the pit, and direct connected to one line shaft running the length of the pit, the power from this shaft being transmited to the shaft along the opposite side of the pit by a Reynolds noiseless chain belt passing across the pit near the center of the hoist.

The hoist pit, the form of which will be understood from the drawings, is built entirely of concrete reinforced with corrugated steel beams 6 ins. apart. All bolts for jacks, journal boxes and pedestals were set by template before the concrete was poured and rammed. The pit was installed by M. P. Houlard, assistant engineer of the New Orleans Railway & Light Company.

INTERURBAN TRAIN TESTING APPARATUS

BY SYDNEY W. ASHE

During the past few months it has been the privilege of the writer to develop a new simple type of train testing set and to demonstrate its practicability by a series of train tests.

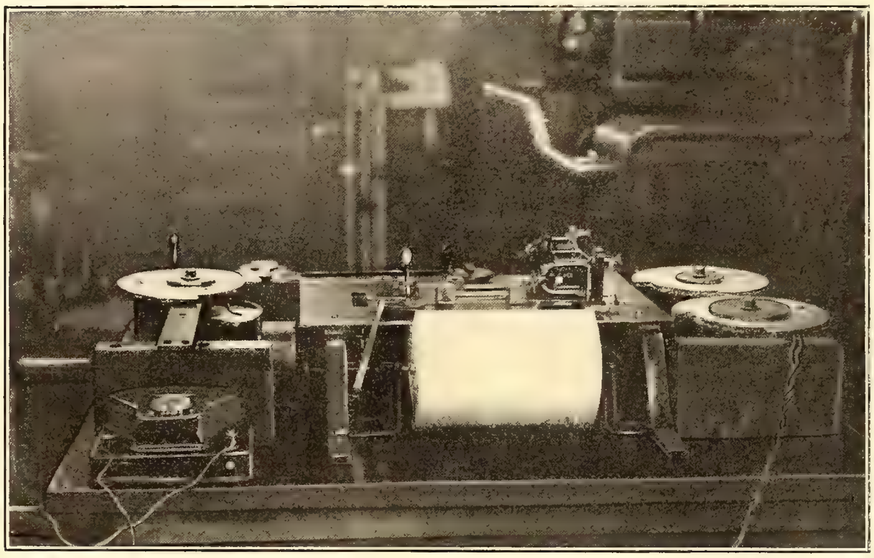


FIG. 1.—RECORDING INSTRUMENT IN POSITION

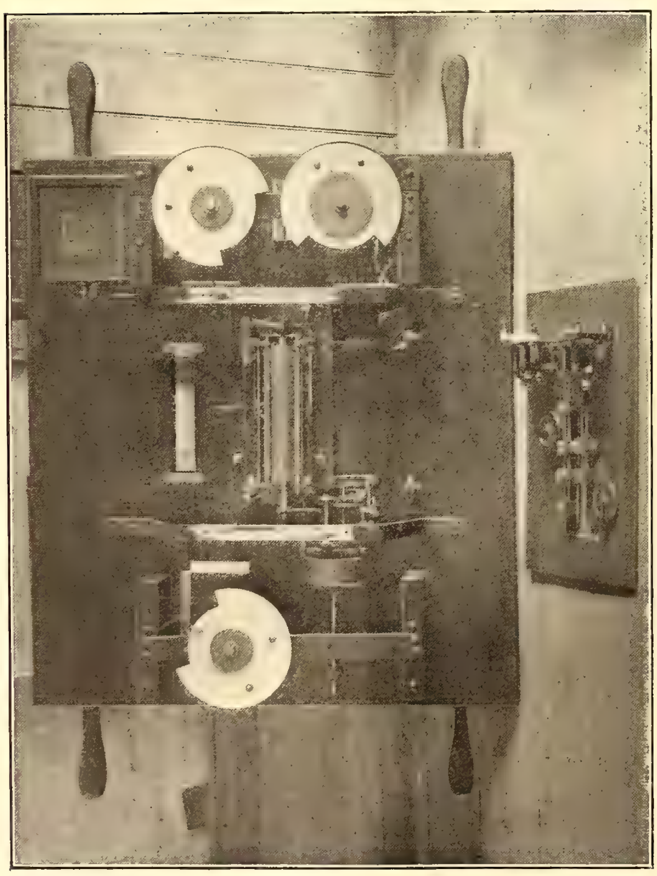


FIG. 2.—SHOWING ARRANGEMENT OF ROLLERS

These tests were made on new rolling stock property of the Brooklyn Rapid Transit Company. They were four in number, and consisted of a run with a single motor car equipped with Westinghouse unit switch control, a run with the Brooklyn Rapid Transit instruction motor car, a test on the Coney Island Express, and a test on a large four-motor interurban trolley car.

The instrument used in connection with these tests recorded line voltage, motor current, wheel revolutions, time in half seconds, and instantaneous speed. The instrument is built upon lines somewhat similar to the Keiley recorder described in Vol. I of "Electric Railways," published jointly by the writer and Mr. Keiley. Unfortunately, with the Keiley recorder it was impossible to obtain a satisfactory speed-time curve, as it was first necessary to plot a distance-time curve and then draw tangents to this curve to obtain values convertible to speed. In drawing such tangents results were obtained whose accuracy varied anywhere from 10 per cent to 40 per cent. With the recorder built by the writer, a continuous record was obtained direct of instantaneous speed of the car. The instrument could be modified so as to record acceleration directly, but it was realized that a speed-time curve was of greater moment than an acceleration curve. For instance, from a speed-time may be obtained the maximum speed, the speed passing around curves, the rate of acceleration, the rate of braking, the distance traversed, and the average speed. Most of these quantities are indicated directly by a speed-time curve, whereas with an acceleration curve the curve must be integrated with an integraph to give speed values.

The instrument Fig. 1 consists of a spring motor taken

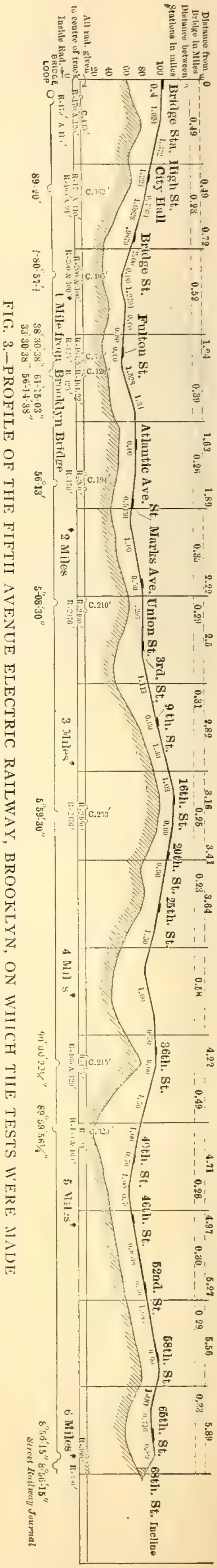


FIG. 3.—PROFILE OF THE FIFTH AVENUE ELECTRIC RAILWAY, BROOKLYN, ON WHICH THE TESTS WERE MADE

from a large Edison home phonograph. This motor is geared directly to a shaft carrying a wooden roller. Pressing against this roller are two other rollers covered with rubber tubing. One of these rollers is pressed against the large wooden roller by a spring. The other roller has a small play between it and the large roller. The motor is equipped with a governor which is set so as to pass the records at a rate of 5 inches of paper in nine seconds. The paper as illustrated in Fig. 1 is 8½ ins. in width, and is mounted upon wooden cones in turn mounted upon an axle which revolves upon centers. Pressing against the paper holder is a flat spring which keeps the paper taut. Two small guides are provided to limit the side play of the paper. By this arrangement it was found that the paper passed through very smoothly and evenly. The records were made with soft wooden pencils, mounted so as to pass through small brass tubes and weighted with pieces of lead. Care was taken to see that all of the pencils were in line. The method of using springs for the pencils was abandoned, owing to the conditions demanding some arrangement whereby the pencils could be quickly removed in case of breakage of the points or hard spots in the lead,

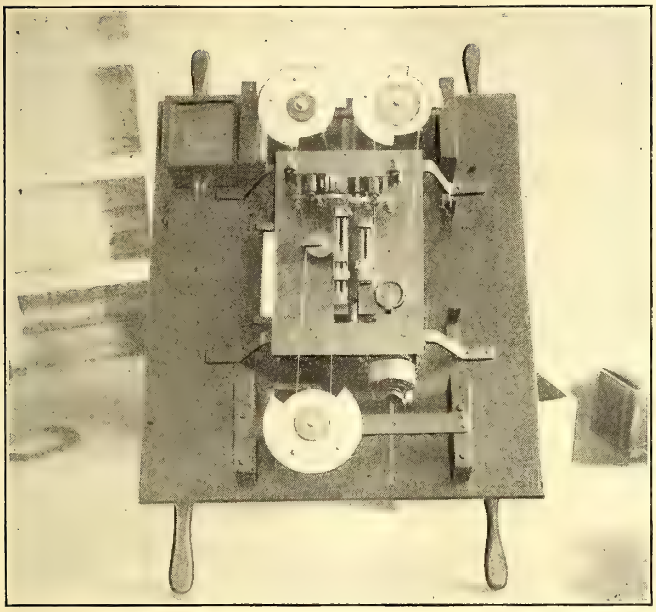


FIG. 4.—TOP VIEW OF PORTABLE INSTRUMENT, SHOWING PENCIL HOLDERS

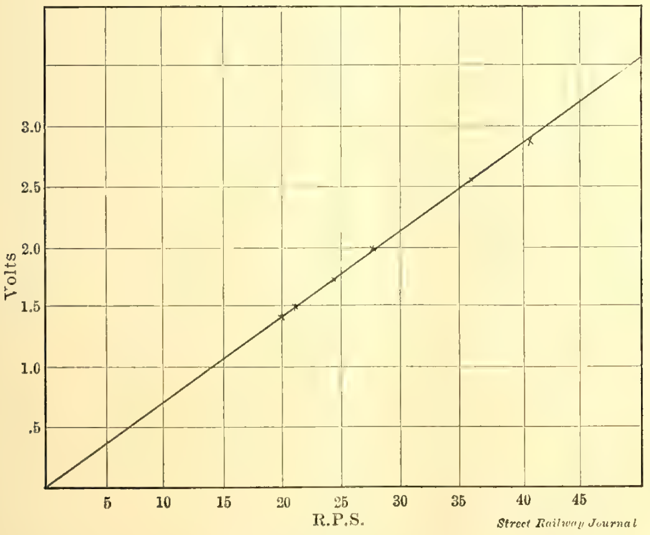


FIG. 6.—CALIBRATION CURVES OF WESTON MAGNETIC TACHOMETER

and also that the proper pressure of the pencils against the paper when once determined could always be kept the same. The method selected was simple and never failed once during the tests. Another point in its advantage is that it is impossible with this arrangement for the tension of the pencils to be so great as to tear the paper.

Referring to Fig. 2, the arrangement of the rollers is evident, and in Fig. 4 the arrangement of the pencil holders as mounted on sliders may be seen. The general recording apparatus is mounted upon an ⅛-in. steel plate over the paper moving mechanism.

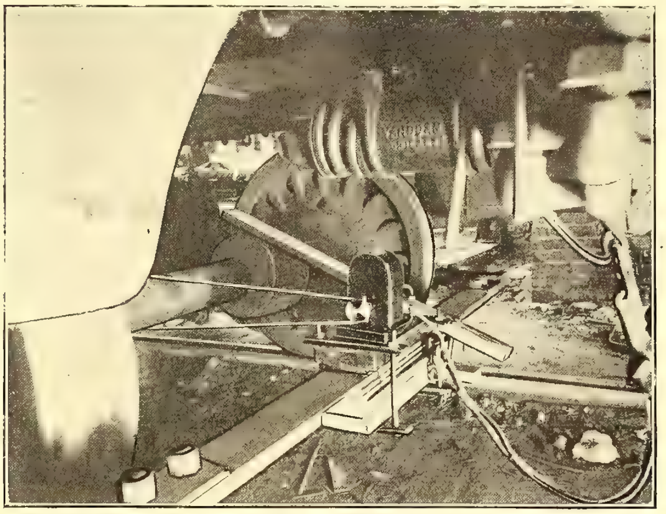


FIG. 5.—MAGNETO FASTENED TO TRUCK

A portable Weston ammeter and two voltmeters are mounted rigidly on both sides of the recording mechanism as illustrated in Fig. 1. Circular discs with pointers attached are mounted over these instruments so that variations of the pointers of the needle may be followed. Flat-grooved pulleys are mounted upon these sectors and wires passed around these pulleys, and pulleys on the plate of the instrument transmit the motion of the sectors to the pencil holders which are fastened to the wire. This arrangement is constructed to be absolutely free of play or lost motion of any kind. The wire is steel piano wire, and its extremities are fastened to the sectors by screws when the wire has been drawn taut. The wire is passed twice around the pulleys so as to obtain good bearing surface. The diameter of the sector pulleys

FIG. 7.—WATCHING THE TEST RECORD

varies, depending upon the amount of distance to be moved over by the recording pencil. Referring to Fig. 4, the largest pulley on the sectors records current, to its side is the speed recording sector, and opposite is the line voltage sector.

Mounted upon the bed plate of the instrument are two relays, equipped with pencil holders. One of these relays records wheel revolution, being connected in series with six cells of a dry battery and a contact maker mounted upon the trailer truck. The other relay records half-seconds, being connected in series with three dry battery cells and an electric time contact. The time contacts are made by platinum contacts, one of which is mounted upon the balance arm of a Seth Thomas clock, the other contact being mounted upon the retaining case of the clock. One terminal of the battery circuit is grounded on the casing of the clock. As the balance arm of the clock moves to and fro it closes the circuit at half-second periods. The platinum contacts are one-half inch in length, and are carefully adjusted so as to make contact only in one spot and not to be so rigid as to stop the motion of the clock. A little care in adjustment results in a very satisfactory performance of the clock. The clock is then adjusted by means of a stop watch so that the regulator is in the proper position, in which place it is rigidly fastened, as the whole accuracy of the results of the test depend upon the performance of the clock. A true record of instantaneous speed is obtained with the recorder by mounting upon the cross-beam of the trailer truck a Weston magnetic tachometer as illustrated in Fig. 5. In the tests made by the writer the magneto was mounted upon one-inch rubber cushions to lessen the vibration. A small 1/8-in. leather belt connected the magneto to the 5-in. car axle. A little care in fastening the belt resulted in very satisfactory operation of the magneto. It is interesting to note here that throughout the tests the magneto belt never left the pulley and there was no slippage, as it required practically no power to revolve the magneto shaft. When we consider that the axle is equivalent to a pulley of 5 ins. diameter of extreme width of face, the advantages of this method of attachment are at once apparent. It is, of course, essential that the car axle be true, but if this is not so the condition is soon obvious by variations of the voltage generated. As the magneto has permanent field magnets, it generates a pressure directly proportioned to the speed with which it is rotated, bearing a constant relation to the car speed. The calibration curve for this instrument is reproduced in Fig. 6. Before and after the test the magneto was recalibrated to determine what effect the vibration of the truck had upon the permanency of the field magnets. Repeated calibration showed absolutely no variation from the standard curve. As to whether this condition would remain so for an indefinite time can only be demonstrated by future tests. With a good roadbed, smooth rails and standard tracks, the amount of pounding is much smaller than is ordinarily supposed.

FIG. 8.—BEFORE THE TEST OF THE "CONEY ISLAND EXPRESS"

Leads were led up from the magneto to the recording device, sufficient slack wire being left so that the leads would not pull passing around curves. At a speed of 24.8 miles an hour the magneto generated 1 volt. The variation from this value depends upon the diameter of the car wheel and the exact diameter of the car axle. For ordinary speeds a 1½-volt voltmeter gives about the maximum range over the paper, and consequently the greatest accuracy. Prior to the test the car was moved over a given stretch of track, and the distance passed over by a given number of wheel revolutions was noted. This distance was accurately taped and the circumference of the car wheel determined. This is essential before every test, as the wheels may have been turned down owing to skidding by a green motorman. The true running circumference of the magneto pulley was determined by driving it in the laboratory at the Polytechnic with a variable speed motor to which it was belted. The speed of the motor and the magneto were measured, and with a knowledge of the circumference of the variable speed motor pulley the running circumference of the magneto was quickly determined. This is essential, as the magneto pulley is grooved.

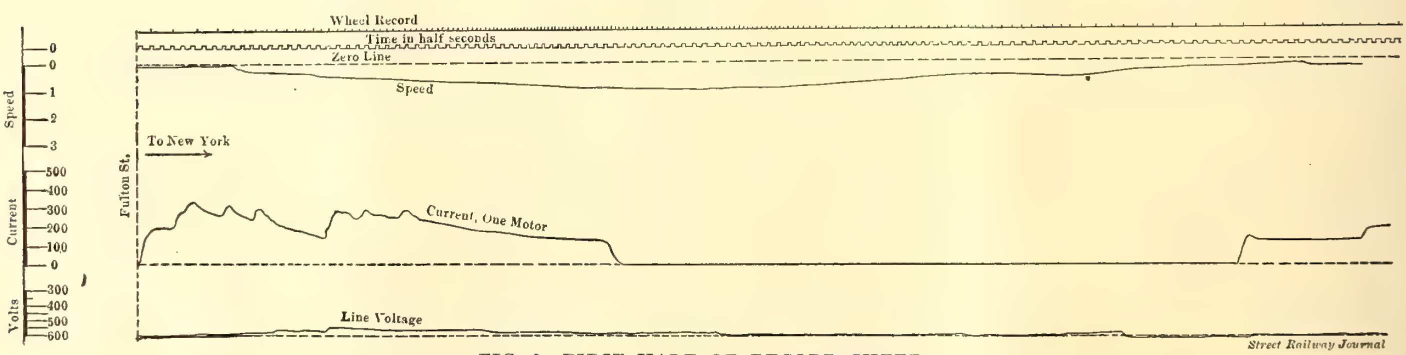


FIG. 9.—FIRST HALF OF RECORD SHEET

When the car is about to start, the paper moving mechanism is started in operation, the time circuit closed, the motor spring and the clock spring wound, the pencils carefully looked over, and one man stands over each sector so that the variations of the pointers may be followed (see Fig. 7). The signal is given and the car starts. One man looks after the

paper as it comes through, carefully rolling it up and watching the operation of the instrument. At each station the name of the stop is called out and marked down on the paper by the previous individual. The variations in speed and the variations in the line voltage are easily followed by the men at the pointers. The man at the current device has to watch closely while the controller is notching up, but with a little practice he is able to follow with surprising accuracy the variations of the motor current. There is a very slight personal lag on the part of the operators, which is about equivalent to that due to the inertia of an automatic instrument. The only difficulty appears to be in following the maximum peaks of the current curve, but these values are checked up by two other men on other ammeters connected in the circuit. Furthermore, the duration of the peaks is extremely small. These men note the value of every peak between stations and tabulate these values in proper form. The ammeters are connected one in the line circuit and one in the F′ or ground circuit of one of the motor field coils. This is done to avoid changing over ammeter leads when the reverser is thrown. The line voltmeter is connected across the circuit from line switch to ground. As the paper passes through, records are made by the pencils as illustrated in Fig. 9, namely, wheel revolutions, current in half seconds, instantaneous speed, current, line voltage. At frequent intervals the instrument is calibrated by passing through paper and placing the pointers of the sectors over various definite positions of the instrument scales. The scale for the instrument is subsequently drawn on the run sheets as illustrated in Fig. 9.

The results from the run sheets can be very readily transferred to co-ordinate paper by means of proportional dividers. The zero lines are drawn on the run sheets for current, speed and the normal voltage datum line is drawn, 600 in this case. Assume that the speed time curve is to be plotted from Fig. 9, the proportional dividers are set so that one volt on the speed scale corresponds to 24.8 miles per hour on the sheet of co-ordinate paper. As stated before, this factor of conversion varies with the diameter of the car wheel and the diameter of the car axle upon which the magneto belt plays. By placing the run sheet on a drawing board so that the datum speed line is parallel to the side of the board the time values in seconds or half seconds may be readily transferred to the speed curve and the dividers adjusted so as to transfer the speed ordinate to the curve sheet in the proper proportion. The train sheet represents the various values from the record plotted to scale. The distance curve is readily transferred to this plotted. Passing a planimeter over this curve, the kilowatt-hours are determined and converted into kilowatt-hours per ton-mile. In the problem under consideration (curve sheet Fig. 10), the run was for a single car between Fulton Street and Bridge Street on the Fifth Avenue line of the Brooklyn Rapid Transit Company. This run was selected, as it represented a point on the line where considerable energy was consumed. The watt-hours per ton-mile amount to 179. This was caused by a sharp curve and a grade (see profile map, Fig. 3) which necessitated two applications of power. The run was selected car moving to New York. A convenient check on the results of the power curves is a record-

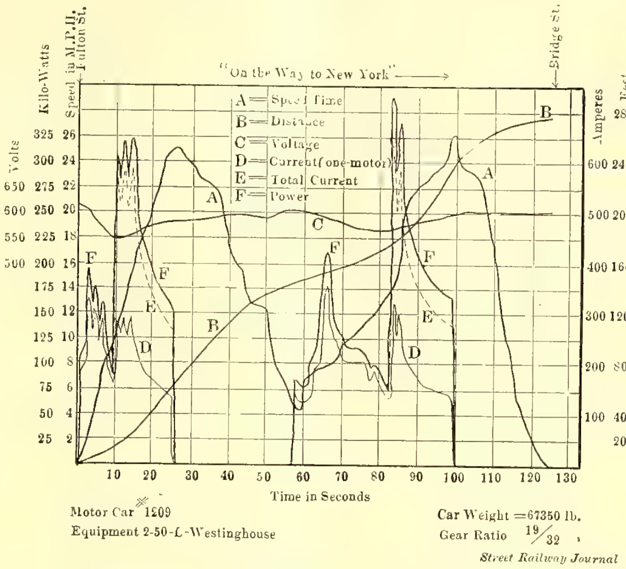


FIG. 10.—RESULTS OF RUN BETWEEN FULTON STREET AND BRIDGE STREET STATIONS SHOWN GRAPHICALLY

ing wattmeter connected in the train circuit to give values between stations and for the whole run.

With this method of obtaining a speed time curve there are three checks on the distance traversed, namely, the known distance between stations, the distance as indicated by the distance curve, and the distance represented by the area of the speed-time curve. In the case worked out the distance between stations was .52 mile, the distance corresponding to the distance curve varied four feet and the distance corresponding to the speed-time curve varied 4 per cent. This latter error could be caused by the variation of the thickness of a line when setting the proportional dividers.

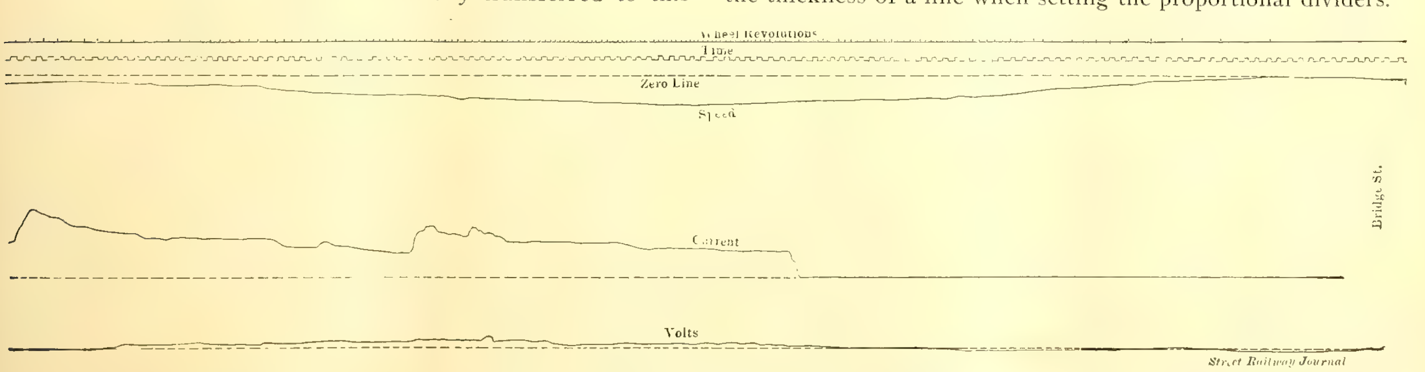


FIG. 9.—SECOND HALF OF RECORD SHEET

sheet by counting the wheel revolutions for a number of seconds and multiplying by the circumference of the car wheel the distance traversed is at once determined. The record indicates current passing through one motor, so the current values in the multiple position are doubled to give the total line current for this equipment. The voltage values are multiplied by the current values and the kilowatts determined and

The acceleration is practically one mile per hour per second as obtained from the record. This is rather low, but the conditions under which the car was run justified it, as the station stops were short. One great advantage of the record of current produced by this recorder is that various types of control may be studied, the action of the throttle relays in notching up the control may be observed, and the character-

istic of the motorman may be determined. In closing, the writer wishes to state that the successful construction and operation of this instrument was due in large part to Messrs. Hewlett and McCarty, of the Brooklyn Polytechnic, whose thesis covered this work. The success of the tests was due largely to Messrs. Calderwood, Gove, Smith, Dempsey and Brown, of the Brooklyn Rapid Transit Company, whose kindly co-operation the writer appreciates.

CAST-IRON AND STEEL WHEELS IN CITY SERVICE

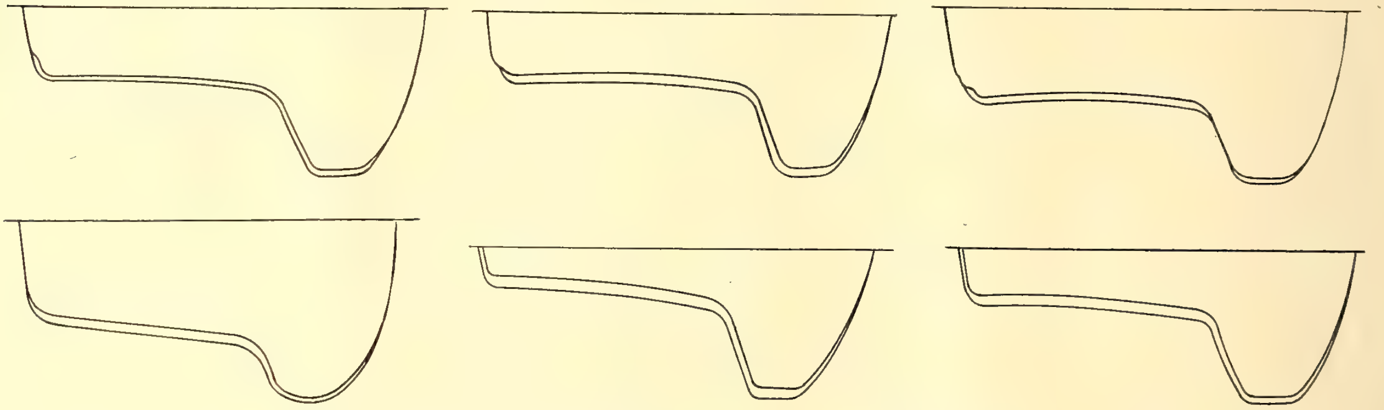
BY JAMES ANDREWS

If memory serves me aright, there were troubles even in the old days of 16-ft. cars and horse power, with wheels, axles and journals. Everything was not bright and serene for the foreman, but the low-flange, narrow-tread, light cast-iron wheel did its work well and satisfactorily and no one dreamed that anything else in the way of increased weight or better material would ever be required. Street railway men were comparatively reluctant to change the type of rolling stock that had served so well, and there was more or less opposition to the introduction of trucks, the lengthening of the cars, the raising of the floors and the other modifications demanded by the successful introduction of electric traction. But when the necessity for these modifications had been fully realized, street railway managers swung promptly into line, and it is many a day now since there has been any criticism of these one-time novelties. In the matter of wheels we have clung to old practices longer than would have been expected, and longer than would have been done had not first cost been a factor that had to be considered. We have retained the multitude of flange shapes that existed in the horse-car days, and have made few changes in their dimensions or contour. It seems that a flange ⅝ in. or ¾ in. high is amply sufficient to hold even the heavy cars of present-day service on the rails, and for urban work there seems to be little reason why there should be a change.

In material we are coming nearer to steam railway practice because the requirements are also approaching it. The making of horse-car wheels was recognized as an entirely different art from that of manufacturing steam-car wheels, and they were usually made in separate establishments, the maker of one class seldom trespassing on the domain of the other. But now that street cars weigh more than the old cars on steam roads and wheels are made to weigh more, the practice in the two classes is coming together.

On a city road with a heavy and short headway service the wheel question is a serious one and is attracting close attention. It should, and in many cases it has, resolved itself into a consideration of economy of operation rather than that of first cost. There are three points in the matter that demand attention: shall the wheels used be of a cheap cast iron, an expensive cast iron, or steel? It would seem that the first of these two should be eliminated from the discussion, but it is not. However, that is a point that will be disregarded here and taken up later in another article. What we have to deal with is the relative merits of steel and cast iron as metals for street-car wheels, in the light of ultimate economy.

In first cost the steel wheel requires by far the greater outlay, ranging from two and a half to three times as much, dependent upon the grades of the two types that are compared. Hence it is evident that the steel wheel must offer some very decided advantages relatively to its rival, in order that its purchase may be warranted. That some managers think it does offer such advantages is evidenced by the fact that after a long and careful trial they have become large purchasers of steel wheels for equipment that was formerly carried safely and satisfactorily by those of cast iron. The word "satisfactorily" is used in the sense that a man will be satisfied with the best he knows of until something better has been used. The well curb satisfies until the housewife has tested the convenience of running water and a bathroom.



FIGS. 1 TO 6, ILLUSTRATING THE WEAR OF CAST-IRON WHEELS

The argument that has been advanced most vigorously against the steel wheel is that, in city service, it is the brake shoe that is responsible for most of the wheel wear, and that this will be as hard on the steel as the cast wheel; therefore there will be nothing but extravagance in the use of steel. This conclusion would be all right if the premises could only be granted without modification. But it can hardly be acknowledged that the brake shoe is responsible for the major portion of wheel deterioration, and the statement that it will wear the steel wheel as rapidly as the cast one will not hold water at all, for just the opposite is the case.

As for the peculiarities of abnormal wear, it is probable that what will affect one class of wheel will affect the other also. That is to say: suppose truck or track conditions are such that there is a tendency of the wheels to run sharp in the flange. Cast and steel wheels will be affected in the same way; but with the cast wheel every fraction of an inch that is worn from the chill cuts into softer and softer material, increasing the rate of wear, while with steel this does not occur. In fact it seems to be true that the resistance of a steel tire to wear increases to a depth of about ½ in. below the surface, then falls off a little, after which it remains constant at a point somewhat higher than at the surface of the tread. This point, however, needs further corroboration. In any event, a removal of the causes tending to running sharp leaves the metal of the steel unimpaired, while that of

the cast wheel is ready for further natural deterioration.

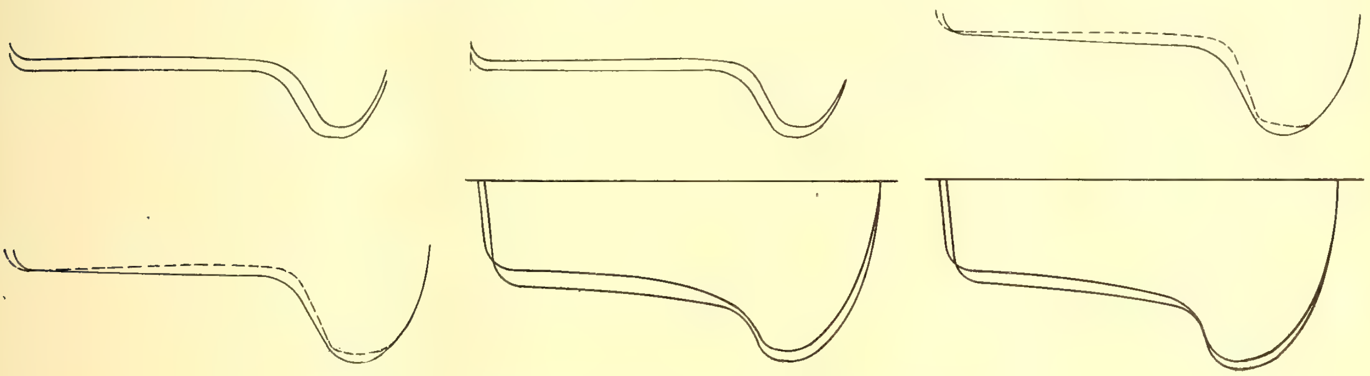
As for the form assumed by the tread and flange under normal conditions of wear, there is not much difference. Figs. 1 to 6 show the original and worn contours of a number of cast wheels taken from three different roads. In these it will be seen that the worn contours conform very closely to the shape of the originals: the wear of the top of the flange is about equal to that on the tread, so that when this condition prevails the wheel remains in first-class shape until it is worn out. The same state of affairs is shown by the wear of steel wheels in Figs. 7 to 12. From this it appears, then, that as far as character of wear is concerned there is not much difference. Experience also shows that where wheels are not subjected to abnormal influences, this uniformity of wear may continue to the end, for steel wheels have been run for 150,000 miles without turning and with the tread and flange in good condition.

As for the rate of wear, that is different. Cast iron wheels are frequently bought on a guaranteed mileage of 40,000. The makers know that the roads do not keep accurate mileage accounts and so cannot hold them to the guarantee; while the roads consider the contract as a piece of successful bluffing on their part. As a matter of fact, 30,000 is a big mileage for a cast wheel in city service, and 20,000 is much nearer the average mark. That of the wheels shown in Figs. 1 to 6 ranges from 2395 to 5611 per 1-16 in. of wear, with an average of 3454. In the case of the steel wheels shown in Figs. 7 to 12, the mileage per 1-16 in. of wear runs from 4210 to 7233, with an average of 5520. This is nearly 60 per cent in excess of the cast wheel. If the total wear of the cast wheel is put at 6-16 in., and it is granted that the rate will remain consistent with that of the tread, which is granting a good deal, the final mileage will be something less than 21,000.

Steel wheels can readily be obtained that will give 2 ins. of wear. But even 1½ ins. wear on the tread will give 132,880 miles at the rate stated, or a guarantee of 150,000 miles can be obtained. In short, one steel wheel can be counted upon to outwear five of cast iron, at an original cost of three times as much. To this must be credited the cost of four removals and refitting of the cast wheels, which will run their cost still farther above that of steel. Interest on the excess cost of the steel wheel will not cut down the saving to a serious extent, and we still have a substantial gain in dollars and cents on the books to warrant the original expense. There is, however, another saving that does not appear on the books, but which, in the opinion of some managers, at least, is sufficient to warrant the use of steel wheels. It is worth something, much, in fact, for a road to have its equipment ready for service. The use of steel wheels contributes toward this end. The running in of cars for wheel renewals, especially for flat spots, is avoided to a great extent, thereby making it possible to utilize a larger percentage of rolling stock at all times and thus cut down that unknown item that might properly be called the rental of repair tracks. Just what this may amount to no one can tell, but those who have studied the matter claim that it is quite enough to pay the interest on the extra first cost of the wheel equipment.

This renewal for flat wheels and chipped flanges and treads drops into insignificance and wheel troubles are reduced to a minimum. As for safety, this does not enter into the question, since very few injuries are ever inflicted on persons or property by wheel failures on city streets.

It would seem, then, that a careful analysis of the whole subject will demonstrate that, considered from the two-fold standpoint of actual cash saving and convenience and reliability for service, it will be a paying proposition for a city road with heavy cars and frequent service, and where land values are high, to use a steel wheel; and that this will hold all of the way down the line, though with a probable decrease of actual and probable saving as we approach conditions in which the work is done by a light car hauled by horses.



FIGS. 7 TO 12, ILLUSTRATING THE WEAR OF STEEL WHEELS

TUNNELING IN NEW ORLEANS

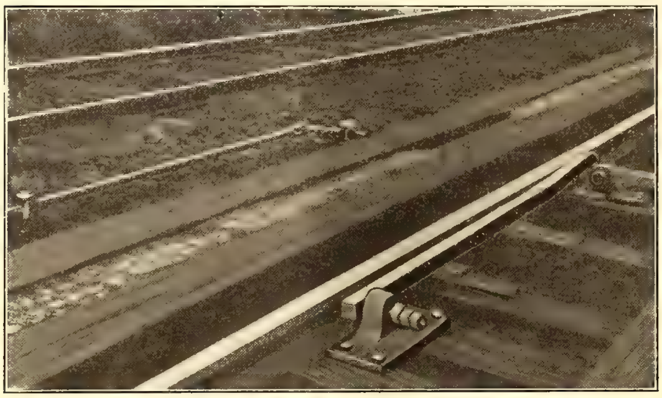
A novel piece of engineering work is being done by Sanderson & Porter in the construction of the big water main for the Claiborne power house of the New Orleans Railway & Light Company at Elysian Fields and North Peters Streets. Heretofore in New Orleans the openings for the large water pipes have been dug down from the surface of the earth; in this instance the engineers are tunneling through the ground from the power house, straight to the river. The water main is 7 ft. 9 ins. in diameter, and is being constructed as fast as the tunneling progresses. The tunnel will be about 280 ft. long; its depth at the power house will be about 15 ft., from which it will incline to a greater depth as it reaches the river. The digging through the earth is done by six cutters attached to jacks which are driven by hydraulic pressure. These jacks uphold a shield which is forced through the ground dug out by the cutters and holds the walls of the tunnel in place. As fast as the shield is forced along the space is taken by the sides of the pipe, which are built up in sections and securely riveted.

The second annual picnic of the employees of the United Railway Company, of St. Louis, was given Aug. 30 and 31 at Creve Coeur Lake. One-half of the employees attended the first day and the other half the second day. There was a barbecue, baseball games and athletic games of all kinds.

DEVICE FOR STOPPING CARS ON GRADES

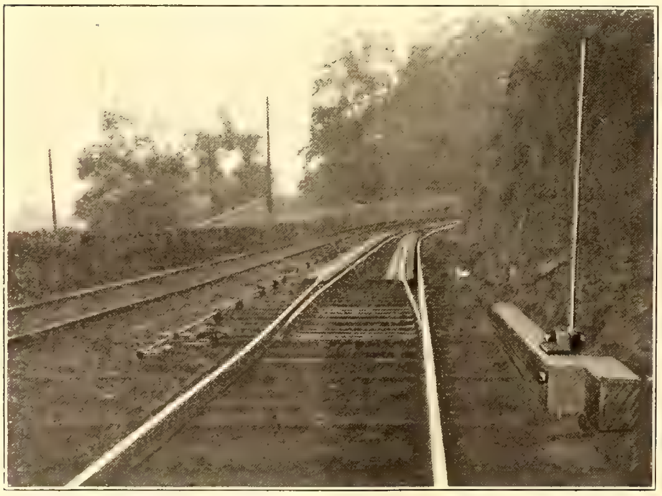
The New Jersey & Hudson River Railway & Ferry Company operates a number of lines in Northern New Jersey and connects with a ferry line running to West 129th Street, Manhattan. In climbing the sides of the Palisades the tracks take a zigzag course up the face of the cliff and ascend at an average grade of about 7 per cent.

As a precautionary measure in order to avoid any possibility of accident should a car run away, the company some



LEVER FOR AUTOMATICALLY RESETTING SWITCH TO SANDED TRACK—NEW JERSEY & HUDSON RIVER RAILWAY

time ago installed on all of the steepest grades a simple and ingenious stopping device which will be understood from the illustrations. This consists of a switch or siding track the rails of which are always covered with a layer of sand. The switch point at the entrance to this sanded track is always open to the main line, so that should a car get beyond the control of the motorman it would necessarily take the switch and run into the sanded track, thereby coming to a stop



ENTRANCE TO SANDED TRACK FOR STOPPING RUN-AWAY CARS—NEW JERSEY & HUDSON RIVER RAILWAY

automatically. The rails of the sanded track are laid close to the rails of the main-line track, so that there is no danger of derailing the car while it is taking the switch. The retarding effect desired is secured by building a trough about each rail of the switch track and filling this trough with sand to a height of 2½ ins. above the head of the rail. The trough is formed by spiking to the ties 6-in. x 6-in. timbers along each side of the rail, the trough being about 5 ins. wide.

Through the courtesy of F. W. Bacon, general manager of the company, the results are here given of a series of tests made to demonstrate the efficiency of the arrangement in stopping runaway cars. The sand track on which the tests were made is located on a 7 per cent grade and the approach to the sand track for a distance of 1500 ft. is also on a 7 per cent grade. The sand track has a switch at the lower end, so that cars which pass into the sand track can be brought back on to the main running rails without backing out. The sand track proper, that is, the section of the siding or second track that is covered by sand, is 180 ft. long, and the sand is generally damp.

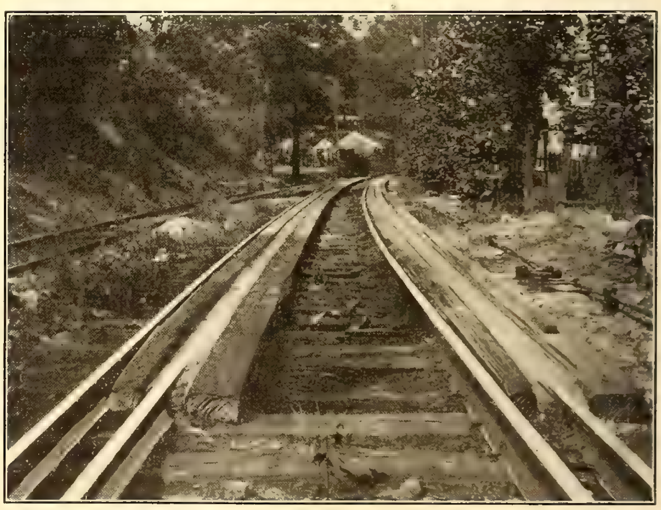
The results of the tests were as follows:

No. of Test	Speed M. P. H. Entering Sand Track	Depth of Sand Over Head of Rail	Distance Car Ran	Remarks
No. 1....	14.5	2½ ins.	80 ft.	Free rolling
No. 2 ..	19.5	2½ ins.	180 ft.	Front truck left track when leaving sanded section, after slight application of air brakes
No. 3....	15.	80 ft. of ½ in. 40 ft. of 2½ ins.	120 ft.	Free rolling
No. 4....	23.	80 ft. of 1 in. 100 ft. of 2½ ins.	180 ft.	Brakes set and wheels slid on last 40 ft. of test, leaving a coating of sand ¼ in. deep on rail.

In test No. 2 the forward truck left the rail at the lower end of the sand track, due to the packing of the sand under the wheel. It was found that where the sand was used to a depth of 2½ ins. over the head of the rail the wheels were lifted by the sand from 1 in. to 1¼ ins. above the head of the rail. In this test the front wheels had traveled off of the lines of the rail at the lower end of the switch where the siding entered the main line and had dropped to the ties. The car was still moving slowly after the application of the air brake when it left the track.

In tests No. 3 and No. 4 the sand of the first 80 ft. of the siding was reduced respectively to ½ in and 1 in. in depth over the rail.

In test No. 4 the car entered the track at a speed of 23 miles



SANDED TRACK AT SIDE OF MAIN LINE TRACKS FOR STOPPING RUN-AWAY CARS—NEW JERSEY & HUDSON RIVER RAILWAY

per hour and ran the 80 ft. through 1 in. of sand and 60 ft. through 2½ ins. of sand, free rolling, without brakes applied, and then slid 40 ft. after an emergency application of the air brakes had been made. The car finally came to a stop with the front trucks just inside the sanded section.

It is interesting to note that in the heavily sanded section of track, when emergency application of the air brake was made the car threw most of the sand out of the trough, leaving a compact layer of sand about ¼ in. thick over the head of the rail. In tests Nos. 2 and 4, both trucks of the car were on the

sanded section when the car came to a stop. The car used in making the test was one of the company's standard closed cars with M. C. B. trucks and 33-in. cast wheels. The weight of the car complete was 22 tons.

From the foregoing tests the conclusions are reached that the sanded track will stop an ordinary passenger car running 17 miles per hour, free rolling, without any application of the brakes, within a distance of approximately 150 ft.

In practice the company requires its conductors when a car is descending the heavy grades to ride on the front platform with the motorman and to hold themselves in readiness to take charge of the car in case of emergency. As the switches are always left open to the sanded sidings it is necessary for the car to come to a dead stop at these points, and the conductor is required to get off and throw the switch for the main line. An auxiliary feature of the device is an automatic tripping mechanism whereby the car, after passing the switch, automatically resets the switch point for the siding, so that any car that does not come to a stop at the switch will always enter the sanded track. This tripping device consists of a lever near one of the rails of the main track and so arranged that when the car passes it is depressed by the flange of the wheel and releases the switch point, thereby setting the switch for the sanded siding.

This arrangement has proven very effective on the New Jersey & Hudson River system, and it is believed the idea contains a suggestion for any road that is compelled to operate over severe grades.

CORRESPONDENCE

RAIL CORRUGATIONS

New York, Aug. 27, 1906.

Editors STREET RAILWAY JOURNAL:

If a further contribution to the discussion in your paper regarding the matter of rail corrugations is in order, I would call attention to a pamphlet issued recently by the Tramways and Light Railways Association of Great Britain, containing a resume of a number of guesses in regard to the matter.

Your editorials in the issue of July 21, and the letter in the issue of Aug. 11 set forth some of the hypotheses that have been advanced to account for the phenomenon. The vibratory and the slipping theories might account for the work but, as stated by your correspondent, no systematic investigations have yet been made to ascertain just what causes are always present in the production of the corrugations.

Evidently weight of rolling stock is an important factor in the development, since, as one writer has pointed out, we do not find any evidence of corrugations on tracks over which horse cars only are run, nor do they seem to have appeared on the early electric roads until the weight of the cars had been brought up to nearly the present proportions. On steam roads there has always been a corrugation at the ends of the rails, and the indentation on the receiving rail of a double-track road is usually quite sufficient to indicate the directions of the traffic regardless of the position of the rail in other respects. It is at this point that the rail has been subjected to an exceptional pressure that manifests itself in the indentation of the rail. That electric roads are alone in the production of corrugations is far from the fact, as has already been pointed out, so that it does not seem probable that the results are due entirely, if at all, to the use of the electric methods of propulsion.

In one of the papers referred to, it is suggested that, "as a current of electricity will flow along the lines of least resistance, and the presence of any undue accumulation of either ingredient of the metal must interfere with the uniform conductivity at that particular part of the rail, and when the wheel through which the current is passing comes in contact with a surface segregation, a local heating is set up, and any consequent softening, however inappreciable, would form the nucleus of a hollow, which, with the chilled tires now in use, would very soon be hammered into considerable proportions."

This would be very well to account for the vagaries of the phenomena, but cannot be accepted intact when we find that the corrugations appear at such regular intervals for one or more rail lengths. Segregation is not spotty but occurs in localized places. Further than this the ordinary segregation does not manifest itself in that part of the ingot that is rolled into the head of the rail but in the web, so that, while there may be alternate hard and soft spots in the head of the rail, these can hardly be attributed to segregation. Up to the present no extensive investigation has been made, as far as any published statements go, that really warrant this assertion that there are alternating hard and soft places in the heads of the rails, and it seems that it is at least worth investigating, considering that the expense for the work would be so small.

Continuing the review of this paper, the statement that "corrugations are only found on electric railways where check rails are applied on super-elevated curves" will not hold water, for they certainly are found elsewhere. Hence the conclusion that has been derived from this misstatement also falls to the ground, namely, that it is due to the skidding of the outside wheel in trying to keep up with the inner one on the curve which has the tendency to run ahead.

In the case of a certain loose wheel that was exploited and somewhat widely introduced on steam and street railways about twenty-five years ago, the wheels were carried on a sleeve that was itself loose on an interior and rigid axle. It was found that the cramping of the flange of the front wheel on the outside of the curve against the sleeve bound the latter so tightly to itself that it turned back in the hub of the wheel on the inside of the curve. If we acknowledge that this same cramping occurs in the case of the rigid wheel and axle, then it is evident that the inside wheel must do the slipping and the corrugations should occur on the inside of the curve. It seems to be absurd that an axle driven by a motor, where the whole tendency of the bottom of the wheel is to move backward on the rail, should actually slip ahead in order to catch up with its mate, and it is difficult to see how wear of treads and flanges, extraordinary as they may appear, can be made to account for this still more extraordinary slip.

The present difficulty seems to be that we have a little knowledge on the subject, and "A little knowledge is a dangerous thing." In this, as in all of the experiences of railroad life and the use of materials, the first results of any investigation are a prolific crop of contradictions, or rather apparent contradictions. Things do not work the same in every place because the conditions of the working are not the same, and as it has already been remarked, a judicious selection of the data obtained from these preliminary observations can be made to prove any point that may be desired. So with this we can prove anything you like.

The vibration and the slipping theories seem to cover the case pretty thoroughly, but it would not be at all scientific to tie to these and then try to procure data to prove the point, for that could be very easily done. Meanwhile it is respectfully suggested that some corrugated rails of different makes and rollings be obtained, and that they be carefully tested for hardness to ascertain whether there is really anything in the theory of alternating hard and soft spots in the head of the rail.

Finally, attention is again called to the fact of the unmistakeable evidence that some at least of the hollow places that appear in the heads of rails used on steam roads are due to the slipping of the driving wheels under the influence of the large pistons and high steam pressure that are used.

ENGINEER.

THE "EVERYBODY BUSY" PRINCIPLE

Aug. 27, 1906.

Editors STREET RAILWAY JOURNAL:

Your editorial on the "Everybody Busy" principle is splendid, and I feel that it is just the hint needed by a good many roads that I have seen, especially small city lines and both large and small interurban roads. The men on the large city railways are all busy as it is, but those on the smaller ones are not. It is as you say, a good man will not object to being given something to do during his idle minutes, as he finds it quite an assistance in passing his time away. On the other hand, many a good man is spoiled by idleness, as idleness surely breeds discontent. Moreover, a man who has several odd little things to do finds his work always interesting. I do not believe in having low-priced men to look and care for electrical equipment, for as a rule they neglect the little things until it is too late. A great many managers will claim that everybody is busy (when they are around), but one who is experienced in shop methods can see a good many things that would escape the observation of some managers. I would like to see the "Everybody Busy" principle in force in all places, as everyone is then more at ease, but it should not be allowed to interfere with tidiness. I would like to see other articles on this principle from time to time, and know it would be a good thing if the first article would impress all as it has me.

MASTER MECHANIC.

SIGNAL EQUIPMENT FOR THE PHILADELPHIA & WESTERN

The General Railway Signal Company has been awarded the contract for the complete automatic block signal equipment for the Philadelphia & Western Railroad. This road runs from the terminus of the Philadelphia subway elevated structure, parallel to the Pennsylvania Railroad main line, due west for 12 miles. The road is double track, but the right of way provides for four tracks eventually. Signals will be spaced 1¾ miles apart, and all will be provided with an overlap of about 2000 ft. Experience on steam roads has shown that track circuits operated by gravity batteries cannot be successfully maintained where the blocks exceed a mile in length. The reason for this is that excessive leakage between the rails makes demands on the battery beyond its capacity, owing to its high internal resistance, and where blocks have been required exceeding one mile in length, it has been necessary to cut the section, thus adding materially to the cost of the installation.

With the system to be installed on the Philadelphia & Western Railway an alternating current is used to supply the track circuits, and inasmuch as the transformers used for this purpose have an unlimited amount of power back of them, it has been found possible where alternating-current track circuits are used to operate blocks three miles in length, without cutting the sections. It is often desirable in interurban roads operating on say five to ten minutes' headway, to extend the length of the blocks from 1½ miles to 2 or even 3 miles in length, and this is made possible by the development of this alternating-current system. If the system were limited to short sections, as on steam roads, the cost of cutting these sections, involving the use of additional reactance bonds, etc., would in a way be prohibitive. The two-rail system will be employed; that is, both of the traffic rails will be available for the return of the propulsion current.

The alternating current for the operation of the signal system will be obtained from transformers in the main generating station, stepping down from 19,000 to 2300 volts. This current is carried by special transmission line the entire length of the road, and at signal locations this 2300-volt current will be further reduced to 50 volts, which in turn will operate the track circuits, signal motors, signal lamps, relays, etc. Since the main transmission line of the road is 25 cycles, the signal apparatus will also be operated at 25 cycles, the same as is being done by the General Railway Signal Company in its installation of the New York Central & Hudson River Railroad electric zone installation.

METHODS FOR PREVENTING DECAY OF WOOD

Secretary George W. Hotchkiss, of the American Forest Congress, has compiled authoritative statistics showing the annual consumption of lumber in the United States to range between 46,000,000,000 and 50,000,000,000 ft. This is food for thought. Wood preservation is not among the new arts, and the primitive charring of wood showed results that induced inventive minds to endeavor improvement in this method. In 1838 Mr. Bethel patented a process in England which specified: "All timber to be treated shall be exposed in the air until fully seasoned." To-day there is not one wood-preserving plant in Europe resorting to steaming to hasten seasoning. Mr. Burnett also patented his process in 1838, and the cheapness of his process induced many to favor it. Practical results very much favored Bethelization, as it became known, and Europe now has no more Burnettizing plants. This latter method has, however, been considerably improved upon by means of injecting a certain amount of insoluble matter into the wood already lightly treated by the old process, and resulted in the newer processes such as the Hasselmann, Rueping and Allardyce methods.

In 1869 Dr. Avenarius, a German chemist of note, made a preparation combining the essential qualities of the two processes, which was then tested out on vineyard posts and proved of such great value that it was placed on the market in 1875 under the name of "Carbolineum," which was later changed to "Avenarius Carbolineum." Dr. Avenarius' idea of a reliable preservative for the vineyard regions of Germany soon spread, however, as its merits became known, and to-day his invention is known in every civilized country. The simplicity of the application which was essential to its success has made the preparation so widely known to-day. Dr. Herzenstein, the noted Russian engineer, in reporting to the International Railway Congress, showed 87 European railroads using a wood preservative, the methods employed being Avenarius Carbolineum, creosoting and chloride of zinc treatment. This method consists of deeply penetrating the wood with a self-impregnating oil of heavy specific gravity, which on account of its chemical ingredients will prevent rot and decay. The American representatives for this material are Carbolineum Wood Preserving Company, of No. 349 West Broadway, New York.

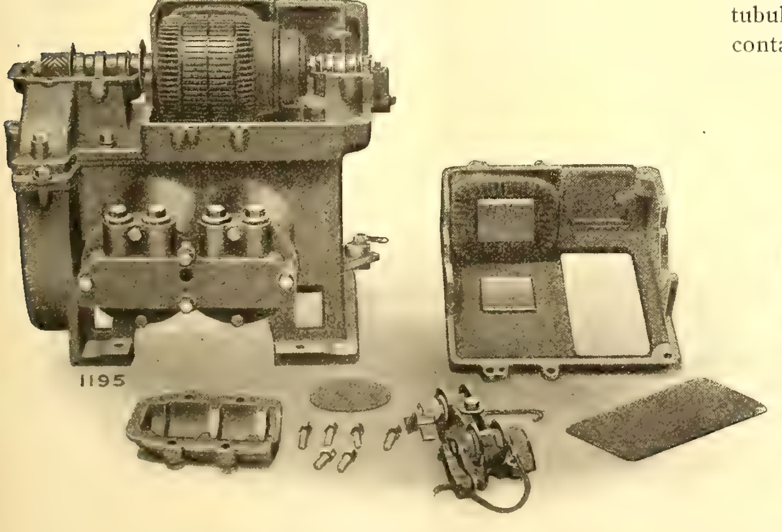
A. F. Schoepf, division superintendent of the Indiana, Columbus & Eastern, met with a peculiar accident a short time ago. He was riding on the front vestibule with the motorman when there was a crash and a broken window and Mr. Schoepf suffered a severe cut on the head. A dead owl was found on the fender, the bird having flown directly at the car.

A NEW TYPE OF AIR COMPRESSOR FOR ELECTRIC CAR SERVICE

One of the first undertakings of the engineering department of the National Brake & Electric Company after the organization of the company last spring was the design of a new type of air compressor for use in connection with air brake apparatus on electric cars. A thorough knowledge of the requirements of a compressor for such work enabled the engineers to embody in the design of the new machine many original features intended to overcome the defects of older types of compressors. A consideration of the conduction of heat to the motor from the crank chamber, of the protection of the motor from dust and dirt, of the accessibility of parts for repairs, and of the external appearance of the machine has resulted in a compressor of the type shown in the accompanying illustrations.

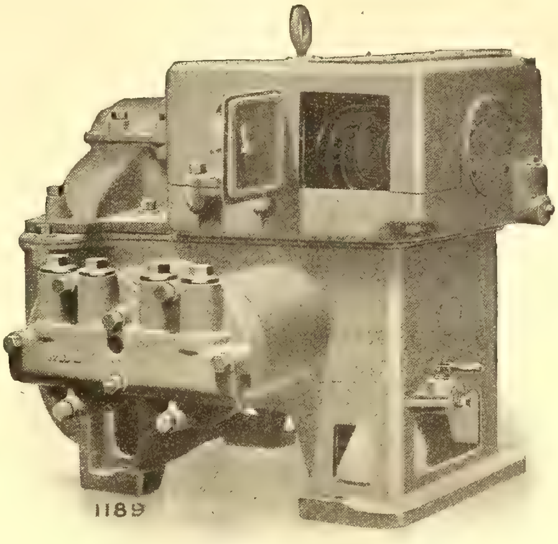
To prevent the heat generated in the cylinders from passing into the motor, the compressor proper and the motor are built as two distinct units. Although the motor is mounted above the crank chamber, it has an independent base and an air space of ½ inch intervenes between the base of the motor and the crank chamber cover. The motor is of the 4-pole, consequent-pole type with fields and armature wound in series. The compressor is of the two-cylinder, single-action type with trunk pistons, and is driven by a herring-bone gear and pinion.

The motor itself is completely enclosed. Hinged doors and removable covers give access to the commutators and brushes. The accessibility of the parts of the motor for repairs may be seen from one of the illustrations which shows the top portion of the motor casing and one of the fields removed. To remove an armature it is necessary only to remove this top portion of the motor casing, together with the bearing caps at either end of the armature shaft. The illustration referred to also shows the liberal size of the brush holder insulators. The grounding of brush holders of compressor motors through the accumulation of oil and dust on the brush holder insulators has heretofore been a source of much annoyance and expense. The proper insulation of the brush holders was given particular attention in the design of the new machine, and the insulators are of such dimensions as to give a leakage surface of about 1¼ ins. The brush holders are provided with an improved spring tension easily and accurately adjusted and which gives a constant tension on the brushes over a wide range.



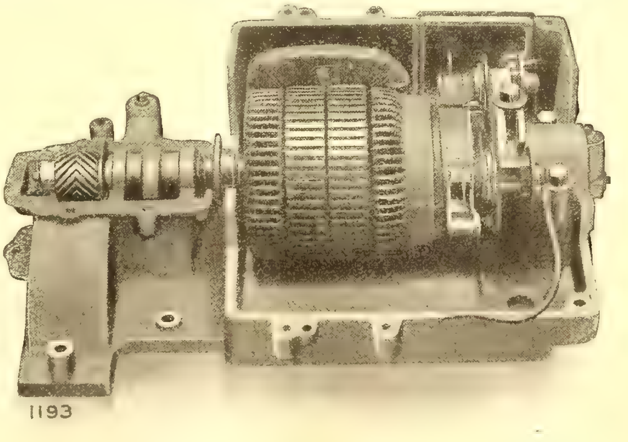
PARTIAL DISSEMBLY OF THE AIR COMPRESSOR, ILLUSTRATING ITS SIMPLICITY AND ACCESSIBILITY

The lower half of the motor magnet frame, the housings for the armature bearings and the cover for the top half of the gear are all formed by one steel casting. This design assures of all parts being kept in perfect alignment. The design of the base of the motor and of the crank case permits the removal of the crank and pistons of the compressor with the least amount of inconvenience. After the cover has been removed from the crank case, the crank may be taken out for repairs without removing the gear from it. The connecting rod head, instead of being loose, is connected to the body of the rod by means of a hinge and hinged eye bolt. This arrangement has the advantage that there is only one bolt to slacken or adjust.



TYPE A-4 COMPRESSOR, COMPLETE

The efficiency and life of the pump and gearing is materially increased by a third bearing for the crank shaft. This bearing, placed at the center of the shaft, steadies it and supports it at its weakest point. The suction and discharge valves are interchangeable and are of cold-drawn tubular steel and are seated by gravity. All of the valves are contained in one head, the discharge valves being in the center and the suction valves on either side. The design of the head is such that the suction and discharge pipes may be screwed directly into it, there being no necessity for elbows or other fittings.



LOWER HALF OF MOTOR, SHOWING ALSO THE HERRING-BONE GEARING

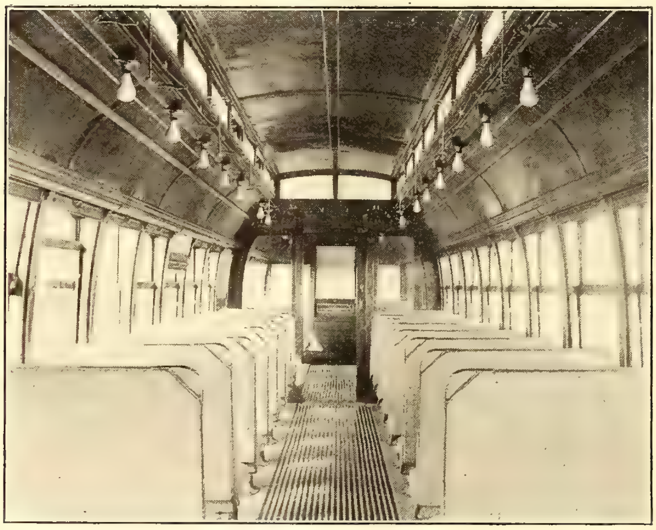
The working parts of the compressor are oiled by splash lubrication. The gear and crank move in a bath of oil contained in the crank case. The oil holes for filling the crank

case as well as the oil drain holes have been arranged conveniently and sightly. The tendency to force the oil vapor and oil out of the crank chamber into the motor bearing and armature has been avoided by providing vent holes in the crank chamber. An oil thrower on the armature shaft between the pinion bearing and the motor casing prevents oil from the bearings finding its way into the armature and fields. A minor point in the design of the compressor, but one that will appeal to the repair man, is that all the cap screws and bolt heads are of one standard size, obviating the necessity of more than one wrench in repair work.

As the compressor is designed to be hung under the car without an enclosing box, it was necessary to give some consideration to its external appearance. Projecting parts have been avoided as much as possible with the idea of improving the appearance. This new type is built in six sizes, the capacity of each size being 11, 16, 20, 27, 35 and 50 cu. ft. of free air per minute.

FINE INTERURBAN CARS FOR KANSAS CITY-WESTERN RAILWAY

The car illustrated is one of four built by the American Car Company for operation on the Kansas City-Western

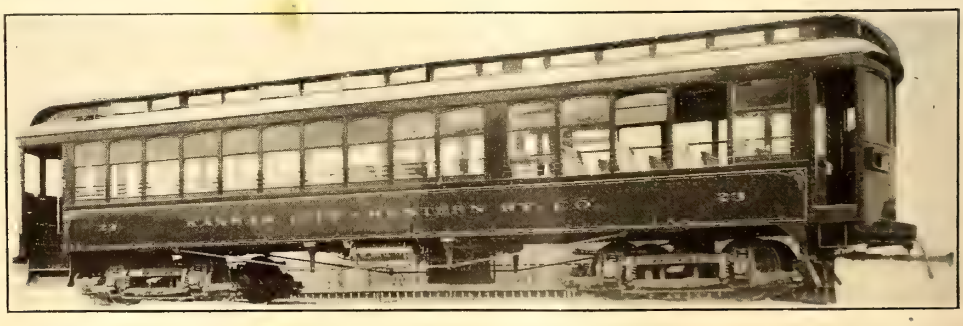


INTERIOR OF PASSENGER CAR FOR THE KANSAS CITY-WESTERN RAILWAY COMPANY

Railway, which runs between Kansas City and Fort Leavenworth, and is of the combination passenger and smoking type. Each car is equipped with four 75-hp motors, enabling a very fast schedule to be maintained. The power house is about half way between the two termini at the town of Walcott, where the company also has a car house, in the immediate vicinity of Walcott Lake, from which the water supply is obtained. The line, which skirts the river for the entire run from Kansas City to Fort Leavenworth, traverses a remarkably beautiful country, and many interesting places are passed en route, those of chief interest, perhaps, being the Soldiers' Home, south of Leavenworth, and Fort Leavenworth, just north of Leavenworth. The grounds of the home cover 640 acres, and a more pleasing site for such an institution could not have been chosen. Fort Leavenworth is also noteworthy, due to its having the most important as well as attractive military reservation in the United States. The grounds extend over 12,000 acres intersected by driveways, buildings and parade grounds. The fort has been greatly added to in recent years by improvements costing several millions of dollars. The terminus of the railway company's system is located in the very center of the post. Aside from the purely military features to be found at Fort Leavenworth, two great prisons, occupying seventeen acres, are maintained by the government, and the cars will take visitors within a few feet of the prison gates. The village of Lansing, also reached by the company's lines, is situated in a great fruit growing country and is of considerable interest owing to the presence of the Kansas State Penitentiary, unique on account of having within its walls a large coal mine which is mined by convict labor through the winter for the purpose of supplying State institutions with coal. Brickmaking supplants that industry during the summer. There are five coal mines in the vicinity in addition to this one.

The new cars seat sixty passengers—forty in the passenger compartment and twenty in the smoking compartment. The seats are of Brill manufacture and have stationary backs with head rolls. Cherry constitutes the interior finish, with ceilings of sheet steel painted and neatly decorated. In the corners of the passenger compartment are longitudinal seats occupying the space of two windows each; the rest of the seats all face forward, and as the cars are only to be operated in one direction, the front platform is arranged for a motorman's compartment and is accessible only by one door at the side. The rear platform is of the usual dimensions and is of the dropped type; the entrance steps are covered with trap doors when the folding doors are closed. The semi-convertible window system is of the Brill type, and four-barred window guards extend from end to end of the car. A substantial bottom framing is employed which consists of 6-in. I-beam center sills with pine fillers and 4-in. x 7¾-in. side sills with 15-in. x ⅜-in. sill plates in the side to which the bases of the posts are screwed; double-trussed needle beams with malleable iron truss rod struts under trusses anchored at the ends of the body bolsters give additional support to the center of the car. No. 27-E1½ trucks are used under all of the cars and have solid forged frames and noiseless brake hangers; the trucks have a wheel base of 6 ft.; wheel diameter is 33 ins.; axle diameter, 5½ ins.

The dimensions of the cars are as follows: Length over the corner posts, 42 ft. 4 ins., and over the vestibule sheathing 50 ft. 4 ins.; length of the smoking compartment, 14 ft. 6 ins.; width over the side sheathing, 8 ft. 6 ins.; centers of the posts, 2 ft. 8 ins.; height from the floor to the ceiling, 8 ft. 5¾ ins.; height from the track to the under side of the sills, 3 ft. 2¼ ins.; height from the under side of the sills over the trolley board, 9 ft. 6⅞ ins.; from the track to the lower platform step, 15¼ ins.; height of the riders, 11½ ins. The weight of a car and trucks without motors is 35,000 lbs.



ONE OF THE NEW CARS FOR THE KANSAS CITY-WESTERN RAILWAY COMPANY

COMBINATION CARS FOR THE SHAMOKIN MINING DISTRICT

The lines of the Shamokin & Edgewood Electric Railway run through the heart of the anthracite coal region of Pennsylvania, and it would be hard to find country of a more beautiful or varied character than that met with on the run from Shamokin to Treverton, a distance of 8 miles. Throughout the entire journey the country is exceedingly hilly, the grades averaging 3 per cent. On reaching the level after a climb for about 3½ miles, descent is made into a second valley where the grade is about the same. The railway company now operates 23 miles of track, but there is a strong probability of the lines being extended to Sunbury, 18 miles from Shamokin, in the near future.

The feature of the cars illustrated, which were built by the J. G. Brill Company, is the large smoking compartment in the combination passenger and smoking car and the equally large compartment for baggage in the other type of car shown, these compartments in each case occupying one-half the entire length of the car. This is due to the fact that the passengers handled consist largely of miners, and in the case of the baggage compartment with its commodious folding seats this can be equally well adapted as a smoking or miners' compartment. The chief features of the car interiors are clearly shown in the illustrations and need not be mentioned. In both cars the car builders' grooveless post semi-convertible window system is employed, and the trucks are of the 27-E1 type with a wheel base of 6 ft.; the wheels are 33 ins. in diameter; axle diameter, 4½ ins.. Four 40-hp motors were installed on each car.

STANDARD PASSENGER CAR FOR THE SHAMOKIN & EDGEWOOD ELECTRIC RAILWAY COMPANY

The following are the chief dimensions which apply to both types of cars: Length over the end panels, 33 ft. 4 ins., and over the crown pieces and the vestibules, 43 ft. 4 ins.; width over the sills and the sheathing, 8 ft. 6 ins.; distance between the centers of posts, 2 ft. 8 ins.; side sill size, 4 ft. x 7¾ ins.; size of the end sills, 5¼ ins. x 6⅞ ins.; sill plates, ⅜ in. x 15 ins.; thickness of the corner posts, 3⅝ ins.; thickness of the side posts, 3¼ ins. Among the specialties are "Dumpit" sand boxes, "Dedenda" alarm gongs, signal bells, and angle-iron bumpers.

SMOKING COMPARTMENT OF PASSENGER CAR

BAGGAGE COMPARTMENT WITH BENCHES FOR PASSENGERS

COMBINATION PASSENGER AND BAGGAGE CAR FOR THE SHAMOKIN & EDGEWOOD ELECTRIC RAILWAY COMPANY

The Toledo Railways & Light Company is building in its shops in Toledo a very fine special car which will be used during the summer months for tours around Toledo, and during the fall and winter months for special parties and excursions either on the city lines or over the interurban lines radiating from Toledo. The car is of the heavy interurban type, designed for high speed, and is luxuriously fitted up with chair seats, smoking compartment, buffet service, etc. General Manager L. E. Beilstein, of the company, will name the car at the time of the Columbus convention of the American Street and Interurban Railroad Association, when with a party of associates and friends he will travel to the convention over the interurban lines by way of Findlay, Lima, Troy and Springfield.

FINANCIAL INTELLIGENCE

Wall Street, Sept. 5, 1906.

The Money Market

There has been a decided change in the local monetary situation during the past week, a combination of unfavorably influences sending rates for both call and time accommodations to unusually high levels for this season of the year. Money on call loaned as low as 5 per cent early in the week, but toward the close the rate worked up to 40 per cent, the highest quotation recorded for demand money at this season of the year since September, 1890: Time accommodations also ruled decidedly strong, charges for all maturities extending from sixty days to six months, commanding 6 per cent, plus commission of ¼ and ½ per cent, bringing the total charges to the borrower up to 7½ per cent in some instances. Mercantile paper reflected the advance in money rates, very little paper being negotiated at less than 6½ per cent for the very best names. The principal factor in bringing about the high rates included the extremely low bank reserves and the increasing demand for money at the principal inland cities, both for general business and for crop moving purposes. The outflow of money from New York during the past week has assumed rather large proportions, and the advance in the rate of New York Exchange at Chicago to 40 cents discount indicates an increasing demand for money at that center. The active speculation in stocks also calls for considerable money. The accumulation of money by the Government continues, the statement of receipts and expenditures for the month of August showing total receipts of $56,007,596, and the expenditures $47,848,449, leaving a surplus of $8,155,157 for the month. The high rates for money resulted in liberal offerings of finance bills by international banking houses, the proceeds of which were made available for market purposes. In fact, the proceeds derived from the sale of these bills constituted the principal supply of money during the week, local bankers being practically out of the market so far as time accommodations were concerned. The heavy offerings of finance and stock bills in the exchange market resulted in a sharp fall in demand sterling exchange to 4.8285, a rate that under ordinary conditions would have resulted in a liberal import movement of gold from Europe. As a matter of fact, however, very little gold was obtained by local bankers abroad, both the Bank of England and the Bank of France advancing their selling prices of the yellow metal in order to keep their gold holdings intact as far as possible. This action on the part of the leading institutions in Europe restricts the efforts of New York bankers to secure gold abroad in the open market, and unless rates of exchange go low enough to offset the restrictions referred to above, the prospects of obtaining relief from that source are not very promising at the present time. The engagement of gold for import for the week amounts to only $1,900,000, of which $1,000,000 was secured in the open market at London, and $900,000 in the open Paris market. Rumors of heavy engagements of gold in Australia were current, but up to the present time these engagements lacked confirmation. One very interesting point in the present situation is the probable effect of a money stringency on the enormous real estate speculation, which is in progress all over the country, and which has tied up an enormous amount of capital, and which has caused apprehension to some of the largest financial interests in the country. The situation is such as to call for relief of a practical kind, and it appears that the only source of such relief is the release of a large amount of money now tied up in the national treasury, and which could be put in circulation through deposits of public money in the national banks.

The bank statement of last Saturday showed that the clearing house banks lost $4,369,300 in cash, and that the surplus reserve was reduced $1,420,675, to $2,869,400, which total is the lowest of any corresponding period in the last seven years. In the corresponding week of last year the surplus was $5,489,875; in 1904, $47,503,400; in 1903, $17,296,975; in 1902, $4,097,050; in 1901, $6,915,875, and in 1900, $27,078,475.

Although the week was broken by the labor holiday the volume of trading averaged over one million shares each day, and the price movements were of a sensational character. The net changes show advances on many stocks ranging from 1 to 7 points, while other active issues showed losses of 1 to 3 points. Notwithstanding the large volume of business the trading was largely professional, but the public has begun to enter, and if the present pace can be maintained there would appear to be little doubt that the so-called big interests will succeed in distributing a very material line of stocks. One of the features of the week has been the disposition of certain large holders to convert securities into cash. The week's developments favored irregularity in the price movement, and included activity in and higher rates for money, the radical speech by Mr. Bryan, an unfavorable bank statement, and the sale of part of the Pennsylvania holdings of Baltimore & Ohio and Norfolk & Western to a prominent banking house, while, on the other hand, sterling exchange ruled weak, a small amount of gold was engaged for import, and it was semi-officially announced that the Great Northern ore deal has been practically concluded. The official statistics of copper metal also were counted on the bull side, the output for 1906 having been estimated at 1,230,000,000 lbs., and the consumption at 1,220,000,000 lbs., leaving a surplus at the end of the year of only 10,000,000 lbs., the greater part of which has already been sold. Rumors of a change of control of St. Paul in the interest of the Union Pacific, together with insistent talk of increased dividends on Atcheson, Norfolk & Western, Chesapeake & Ohio, and several other stocks stimulated bullish activity. The important check to public buying is the condition of the money market. Call money reached 40 per cent and time money was scarce at 6 per cent, and a commission of as much as one-half of 1 per cent. The demand for funds for crop-moving purposes is now active, and the available supply is likely to prove inadequate to meet legitimate demands and to provide for a bull speculation in stocks. The sensational developments in connection with the failure of the Real Estate Trust Company, of Philadelphia, had a bad sentimental effect. A political campaign is about to begin, in which the corporate interests will be openly attacked and socialistic and paternal policies will openly be advocated. While business conditions continue excellent and crop prospects are good, these are being, if they have not already been, discounted. Prices for stocks are high and will probably go higher, but it is time for conservatism and profit taking.

The local traction stocks have not been conspicuous, but Brooklyn Rapid Transit continues to receive good support as a result of the rebate system of fare put into effect.

At the close of the week the Secretary of the Treasury announced that, beginning on next Monday and until further notice, the Treasury will make deposits in national banks to facilitate gold imports. Bonds available for investment by savings banks in Massachusetts and New York will be accepted at 90 per cent as security pending the arrival of the gold. The actual engagement of the gold must precede the deposit, and the deposit must be paid as soon as the gold arrives.

Philadelphia

Very little activity developed in the local traction issues during the past week. The demand for these shares was not large, but in the absence of any pressure to sell, prices held decidedly firm. Interest centered largely in Philadelphia Rapid Transit, which was the leader in point of activity, upwards of 3000 shares changing hands at 28¾ to 29. Philadelphia Company common, after an early decline from 50 to 49, recovered to 49½, on transactions aggregating about 500 shares, while sales of the preferred were recorded at 49 and 48⅝. The directors of the company have decided to issue $3,240,000 of the $6,000,000 new common stock recently authorized, the rights being extended to holders of the preferred as well as the common stock. Stockholders are given the opportunity to subscribe to the new stock at par, to the extent of 9 per cent of their holdings at the close of business on Sept. 5. Ten per cent of the subscription price is payable on Sept. 21, and 90 per cent on Oct. 5. Philadelphia Traction was decidedly firm, 500 shares selling at 99⅛ and 99. Union Traction brought 64¾ and 64½ for odd lots aggregating 300 shares. American Railways sold at 53 ex. the dividend for 700 shares. It is expected that the company's gross earnings for the month of

August will show an increase of from $25,000 to $30,000 over the corresponding month of last year. The Scranton and Joliet systems are said to be showing very handsome increases. Other transactions included United Companies of New Jersey at 255 and 257, Lehigh Valley Traction at 12½, the preferred at 21⅞, and United Traction of Pittsburg preferred at 51.

Baltimore

Trading in tractions at Baltimore was extremely quiet during the past week, the bulk of the business being supplied by the United Railway issues. The free income bonds held steady, about $55,000 changing hands at 70⅛ to 69½ and back to 70, while $5,000 of the receipts, representing incomes deposited, brought 69⅛. The 4 per cent bonds sold at 91¾ and 92 for $13,000, and near the close an odd lot brought 89⅞. The refunding 5s sold to the extent of $31,000, at from 89 to 88⅝ and back to 88¾. Other transactions included 100 United Railway pooled stock at 15¼, $13,900 Maryland Trust Company income certificates at 69¾ and 70, 200 Norfolk Railway & Light stock at 17 and 18, $3,000 Norfolk Railway & Light 5s at 100, and $2,000 Washington City & Suburban 5s at 102¾.

Other Traction Securities

A further substantial rise in Chicago Union Traction preferred was the principal feature of the Chicago market during the past week. Opening at 16, the price rose to 18, and held all of the gain. About 1200 shares were dealt in. The advance was in sympathy with the upward movement in the stock on the New York Stock Exchange. There has been good buying of the stock in the Eastern market for several weeks past. The common stock was very quiet, but firm, several hundred shares changing hands at from 4¾ to 5. Other sales were: South Side Elevated at 98 and 97, West Chicago at 33, Metropolitan Elevated gold 4s at 92, and Northwestern Elevated 4s at 91. The Boston market was quiet, but decidedly strong. The principal trading was in Massachusetts Electric issues, about 500 of the common changing hands at 20¼ and 20, while a like amount of the preferred brought prices ranging from 70¼ to 71. Boston & Worcester common brought 35, and the preferred stock sold at 83¼ and 83. Boston Elevated changed hands at 149½ and 150. West End common sold at 96 and 96½, and the preferred at 108½ and 108.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Aug. 31.	Sept. 5.
American Railways	*53	52
Boston Elevated	150	150¼
Brooklyn Rapid Transit	75½	78⅛
Chicago City	160	160
Chicago Union Traction (common)	4⅞	5
Chicago Union Traction (preferred)	17¼	19¼
Cleveland Electric	70	—
Consolidated Traction of New Jersey	78	79
Detroit United	93¼	93¾
Interborough-Metropolitan, W. I.	38⅛	37¾
Interborough-Metropolitan (preferred), W. I.	78	78½
International Traction (common)	—	—
International Traction (preferred), 4s	—	—
Manhattan Railway	147	146
Massachusetts Electric Cos. (common)	19½	19½
Massachusetts Electric Cos. (preferred)	70½	70
Metropolitan Elevated, Chicago (common)	27	26
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	106	106
North American	93	91¾
North Jersey Street Railway	27	27
Philadelphia Company (common)	—	†49½
Philadelphia Rapid Transit	29	28
Philadelphia Traction	99	99
Public Service Corporation certificates	69½	69
Public Service Corporation 5 per cent notes	95	94½
South Side Elevated (Chicago)	96½	96½
Third Avenue	125	125
Twin City, Minneapolis (common)	115	114½
Union Traction (Philadelphia)	64¼	64½
West End (common)	—	—
West End (preferred)	—	—

* Ex dividend. † Ex rights.

Metals

The "Iron Age" says that the excitement in pig iron has quieted down somewhat, although the danger of a runaway market has not disappeared and is regarded in some quarters as imminent this fall, particularly in foundry iron. Some of the largest interests have reached their full converting capacity anyhow, and with them it is a question of supplying the finishing mills with steel rather than of feeding the steel plants with pig iron.

Copper metal rules decidedly strong. The demand for the metal, especially for electrolytic, is increasing, and prices of all grades are ⅛c. to ¼c. a pound above those of a week ago. Quotations are: Lake, 18⅞ to 19c.; electrolytic, 18⅝ to 18¾c.; castings, 18⅜ to 18½c.

THE BOSTON, LOWELL & LAWRENCE COMPANY

The Boston, Lowell & Lawrence Electric Railroad, another high-speed "interurban" electric road, has filed with the Board of Railroad Commissioners a petition for a certificate that public convenience and necessity require the building of a road through Somerville, Medford, Arlington, Lexington, Woburn, Billerica, Burlington and Tewksbury to Lowell, a distance of 22¾ miles. Like the Boston & Eastern road, it will run almost entirely upon private land, a short distance in Mystic Avenue, Somerville, being the only location in the highway. There are to be no grade crossings. The principal backer of the proposed road is Congressman Butler Ames, of the Fifth Massachusetts District, who petitioned the last general court for a special charter under which to build the road, but on account of a failure to file his petition within the specified time, the petition was not admitted by the committee on rules of the House, which referred it to the next general court. Subsequent to this the now famous "interurban" bill was enacted by both branches, under which promoters of such roads are obliged to go before the State Commssion and secure a certificate of exigency instead of getting a special charter from the Legislature.

TUCKER-ANTHONY—NORTHERN OHIO CONSOLIDATION

The plan for consolidating the Tucker-Anthony lines with the Northern Ohio Traction & Light Company will be consummated at a meeting of the stockholders of the latter company to be held Sept. 18. The lines to be merged are the Canton-Akron Railway Company, the Canton & New Philadelphia Traction Company and the Tuscarawas Traction Company. The stock of the Northern Ohio Traction & Light Company is to be increased from $7,500,000 to $10,000,000, of which $1,038,000 will be issued at this time to exchange share for share for the stock of the Canton-Akron Company. The balance of the financing will be carried out by the Canton-Akron Consolidated Railway Company, which was incorporated recently. This company is a consolidation of the three companies mentioned, and it has a capitalization of $2,500,000. It is the intention of this company also to issue the same amount of bonds bearing 5 per cent interest. Of these bonds, $535,000 will be exchanged for the existing preferred stock of the Canton-Akron Railway Company. About $600,000 will be required to retire outstanding bonds, and a percentage, probably $640,000, will be for future betterments. The Northern Ohio Traction & Light Company is to guarantee the interest on these bonds.

B. R. T. REPORT ISSUED

The annual report of the Brooklyn Rapid Transit Company for the year ended June 30 was issued Thursday morning, as the Street Railway Journal went to press. It shows an increase of $2,139,883 on the gross earnings, which were $18,473,328 during 1906. There is also an increase of $1,502,376 on the net earnings, which totaled $8,031,950. The total income was $8,355,886, an increase of $1,574,176. The net income after taxes and fixed charges have been deducted is $2,742,952, an increase of $1,139,734. The net income is equal to 6.09 per cent on the capital stock of the company. Deducting charges for betterments and additions, there is left a surplus of $2,162,609, which is an increase over last year of $1,012,676. The percentage of operation to earnings is 56.62 per cent, for 1906, as compared with 60.02 per cent for 1905. An extended abstract of the report will be published in this paper next week.

THE SAN FRANCISCO STRIKE SITUATION—STRIKE DECLARED OFF

Coming as it does at a critical time, during reconstruction period in San Francisco, the strike of the employees of the United Railroads can not but be regarded as of serious inport. The trouble between the company and its employees dates from the fire of April 18. The men claim to have been subjected to conditions that materially altered their mode of living and the expense thereof. The work became more exacting, due to a shortage of cars, over which the company had no control. Although the carmen's union and the United Railroads were under a contract till May, 1907, stipulating the present wages of 25 cents to 27½ cents an hour, they have asked for 37½ cents an hour, or $3 for an 8-hour day, maintaining that the present wage is inadequate and the working day too long.

The demands of the men were sent to the company on Aug. 18. The company requested that a decision be postponed until the arrival of President Calhoun, who at that time was in New York. Several communications passed between the corporation and the union, resulting in the ultimatum from the men demanding a definite reply to their demands by not later than Friday afternoon, Aug. 23. Late Friday night the company issued a letter fully setting forth its position, declaring that a decision in the matter could not be reached until Mr. Calhoun arrived, and requesting a postponement of the meeting of the union to take a strike vote from Saturday night, for which time it had been called, until after the conference between the officials and directors of the company.

The postponement was not agreed to, however, and after a protracted meeting late Saturday night, Aug. 24, the men voted to strike, although President Calhoun was due to arrive within 24 hours. This action on the part of the men is looked upon very unfavorably by the people, especially as they acted against the counsel of Mayor Schmitz, and also in violation of the arbitration agreement of the contract with the company.

President Calhoun has issued a statement to the people explaining in detail the standing of the company in the matter, and promising to use the utmost effort to resume service at the earliest practicable moment. He has also issued a statement to the men asking them to return to work pending an adjustment of the difficulties, but as the latter notice was addressed to the men, the union has refused to take any notice of it.

Meantime the business of San Francisco is being seriously hampered. Every vehicle, automobile and conveyance has been pressed into service. The business sections of the city being so widely scattered since the fire makes it extremely hard for the employer to get to work and for any retail business to be carried on. Carriages and trams are not to be had, and automobiles rent for $20 an hour.

The present strike is not the only labor trouble that the United Railroads has had since last April. In the early part of July the linemen of the United Railroads demanded an increase from the company, and when offered the choice of several compromises, struck, taking with them the inside electricians—station and shopmen, members of the Electrical Workers' Union. This strike has not been settled and is still on, although the company has replaced the men who went out and the strikers have, for the most part, secured work with other employers.

Less than a month ago the stationary engineers followed the lead of the linemen, quitting their work at 5 o'clock in the evening, just as the evening rush was beginning.

Shortly after that the trackworkers, employed in reconstruction and in the conversion of cable roads into trolley lines were formed into a union and quit work almost immediately thereafter.

An affiliation of seven unions whose members work for the United Railroads was recently organized, and the matter of a uniform working agreement taken under consideration. This has not been definitely settled yet, and the proposition remains in abeyance.

The first sign of activity from the carmen was the passing several weeks ago of resolutions addressed to the company requesting a speedy settlement of the differences with the linemen. The company replied that President Calhoun would consider the matter of their document upon his arrival.

A despatch from San Francisco, dated Wednesday, says that by a decision of the executive committee of the union the strike has been declared off, and that the men have all decided to return to their positions, prepared to resume operations on Thursday.

From the tone of the reports, it is indicated that the men realize that the whole affair was ill-advised, that the public and the press could not be counted on to uphold deliberate abrogation of contract in the face of the overtures made by the company, and more especially that the company was fully prepared to begin at once with new help a service equally as efficient as that which was given before the trouble. Although it is not stated definitely in the despatches that the question of an advance in wages will be arbitrated, it is indicated that this plan will be adopted to adjust the difference and settle the question as to whether or not, under the extraordinary conditions that prevail in the city, the remuneration for platform work is sufficient.

ELECTRIC RAILWAY PROJECTS IN WASHINGTON

Interest in electric railway matters in Washington is acute now, as a result of the many projects for new lines under way throughout the State. This is especially true of Spokane, where the City Council's time recently has been devoted to the consideration of applications for franchises for lines proposed to be built from that city into adjacent territory. The committee of the whole of the City Council by a vote of 6 to 1 has just recommended that the Council pass an ordinance granting a franchise to the Spokane-Pend d'Oreille Rapid Transit Company, which has right of way for a line from Spokane to Lake Pend d'Oreille, Idaho, 42 miles. The company will also build a spur line from Rathdrum to Spirit Lake, Idaho, 12 miles. W. S. McCrea, acting treasurer, announces that cars will be running to Hauser Junction in six months, and that the line will be completed to Lake Pend d'Oreille in a year.

Stockholders of the Lewiston & Southeastern Electric Railway Company have authorized the directors to issue first mortgage 5 per cent gold bonds to the amount of $3,000,000 on that corporation, and $2,000,000 on the Central Idaho Development Company, dated Aug. 1, 1906, and payable Aug. 1, 1936. The Scofield Company, of Philadelphia, has the contract to build 100 miles of line between Lewiston and Grangeville, Idaho. Work will begin the coming fall.

Surveyors of the Inland Empire Railway Company are in the field running locating lines between Moscow and Lewiston, Idaho, between which points the Spokane & Inland line will be pushed. The company is now clearing a site for its terminal building at Moscow. The company has just completed its line from Coeur d'Alene to Hayden Lake, 9 miles, and has four trains in operation. New equipment is being received from Philadelphia, the cars having an average speed of 37½ miles.

Charles P. Lund, executive officer of the Spokane, Cheney & Southern Electric Railway Company, announces that construction work will begin early in September on the line between Spokane and Cheney, Wash., 19 miles. The company will use the Washington Water Power Company's lines between Spokane and Hayford, 9 miles. The route from Hayford to Cheney is over low grades and has only a few curves. Detroit type motor cars will be used on the line.

A. W. Turner, of Davenport, Wash., announced in Spokane a few days ago that the Big Bend Transit Company, the line from Spokane into the Big Bend country, will be in operation the coming year. Ten miles of grade is ready for steel, and locating is being rushed to the Columbia River.

THE ATLANTA, GRIFFIN & MACON COMPANY INCORPORATED

A charter has been granted by the State to the Atlanta, Griffin & Macon Electric Railroad Company, which will operate an interurban electric railway from Atlanta to Macon. The company is incorporated for 101 years, with a capitalization of $100,000. The road will pass through the following towns: Forest, Jonesboro, Lovejoy, Hampton, Sunnyside, Griffin and Forsyth. It will intersect the following counties: Fulton, Clayton, Henry, Spalding, Pike, Monroe and Bibb. It will be 94 miles in length, not including spurs and turn-outs. According to its charter, the road will enter Atlanta over the following streets: Capitol Avenue over double tracks to Little Street, east along Little Street with single tracks to Fraser, to Rawson and Crew Street; also starting with single track at intersection of Little Street to Crew Street, to Trinity Avenue, joining the first line at Rawson Street, thence along Trinity Avenue with double track to Washington Street, to new Washington Street viaduct, to Gilmer Street, to Ivy Street, to Exchange Place and then to N. Pryor Street, where it will end. The incorporators are as follows: N. P. Pratt, W. A. Wimbish, Clifford L. Anderson, Edwin P. Ansley, Atlanta; W. J. Massee, J. T. Moore, Minter Wimberly, W. J. Kincaid, James M. Brawner, Seaton Grantland and N. B. Drewery, Griffin.

NEW ENGLAND STREET RAILWAY CLUB OUTING

The September outing of the New England Street Railway Club was scheduled for Thursday, Sept. 6, 1906. Arrangements were made for visiting the power plants of the Boston Elevated Railway Company and the gas plant of the New England Gas & Coke Company. The program issued by the secretary was as follows: The party will assemble at Sullivan Square, Charlestown, in school room of the Boston Elevated Railway Company, at 8:15. At 9:00 o'clock there will be a talk by Paul Winsor, president of the club, on "Gas Engines and Gas Plants." At 9:30, through the courtesy of the Boston Elevated Railway Company, special cars will be boarded for the Somerville power station, where an opportunity will be given the party to inspect the newly-installed gas plant. At 10:15 a. m. the party will leave the Somerville power station for the Medford power station, where another gas plant has recently been installed. At 11:15 a. m. they will leave the Medford power station for Everett, where the plant of the New England Gas & Coke Company will be inspected. At 12:30 p. m. special cars will be boarded for Revere Beach. Here a fish dinner will be served at 1:45. After dinner, through the courtesy of the Wonderland Company, the members will be admitted to the following attractions: "Shooting the Chutes," "Descent to Hell Gate," "The Fatal Wedding" and "Fighting the Flames."

POTTSVILLE COMPANY NOT AFFECTED BY REAL ESTATE FAILURE

It is said in Philadelphia that the suspension of the Real Estate Trust Company of Philadelphia will not seriously affect the Eastern Pennsylvania Railways Company. At the time of the suspension the Real Estate Trust Company held a trust fund in connection with the consolidation which was considerably under $100,000 in amount. This, however, will no more than temporarily inconvenience the Railways Company, because it is presumed that as soon as the trust funds are freed it will get its money. The latter was in a trust fund, and it was not an ordinary deposit. Aside from its relation as a trustee, the Real Estate Trust Company is stated to have no connection with the Eastern Pennsylvania Railways Company. The work of accomplishing the physical consolidation and improvement of the properties owned by the company will, therefore, not be interfered with.

TRAFFIC ARRANGEMENT CONTROVERSY AT TOLEDO

The Toledo, Port Clinton & Lakeside Railway Company and the Toledo Railways & Light Company are engaged in a controversy over a traffic arrangement for entrance of the cars of the former company into the city over the tracks of the latter. Heretofore the Port Clinton road entered Toledo over the Lake Shore Electric. Now it is building its own entrance to connect with the Starr Avenue line of the city company, but the traffic arrangement which the city company offers is not satisfactory. The terms offered are said to be a sliding scale beginning with 4 cents per city passenger and reducing to 2½ cents after a term of years. These terms are said to be unsatisfactory to the interurban company, which threatens to start condemnation proceedings for an independent entrance to the city.

CHICAGO TRACTION NOTES

As a consequence of the protest of Maurice F. Doty, city superintendent of transportation of Chicago, against the lack of brake connections between motor and trail cars, the use of trail cars will be discontinued as far as possible on the Madison Street and Milwaukee Avenue lines, recently equipped with the trolley. Double-truck cars will be used instead.

In order to hasten street improvements which have been held up because of the lack of rails of a special pattern specified by the city, the Commissioner of Public Works is endeavoring to secure such rails from the rolling mills. It is reported that his efforts have been rewarded by the discovery of 200 tons of rails of the desired section in Pittsburg.

The city superintendent of transportation is endeavoring to secure a special investigation by the grand jury of recent street car accidents. During the summer, is is reported, twenty-four persons have been killed, and 285 injured. As a means of lessening accidents the following recommendations are made by the superintendent:

The City Council should pass the schedule, fender wheel guards and overcrowding ordinances now before the transportation committee.

"Waiting for time," in the loop district should be prohibited.

The cars should stop on the near crossings only, in the loop district, or two cars should load and unload together at the far crossings during the rush hours.

Cars should be so routed as to run on the proper side of the street.

The companies should be compelled to furnish enough helpers at stub ends to prevent blockades by switching cars rapidly.

It should be made a penal offense for conductors to give the signal for motormen to start the car while a person is partly on or partly off the car.

The company should be compelled to broaden the curves so that the long cars will not block traffic, as at Madison and State Streets.

Steps should be taken to prevent cars being run by men who have been without proper sleep or rest.

The companies should be compelled to employ a sufficient number of track and car repairers and inspectors to keep the cars and tracks in proper condition.

The majority of the accidents in the last fifty days, according to a report made by the superintendent, were caused by passengers alighting and boarding moving cars, forty-six people having been injured in this way. Forty-five people were hurt in crossing before cars, and forty-five vehicles were struck by street cars. Cars starting before the passengers were safely on or off caused thirty-seven accidents, and fourteen accidents each were caused by improper fenders, sudden moving of cars, and people being struck by passing vehicles while on the footboard.

NEW PUBLICATIONS

"Handbook Relating to Bare and Insulated Wires and Cables." By Joseph W. March. Seventeenth edition. Standard Underground Cable Company, Pittsburg, Pa. Cloth, 228 pages, 3½ ins. x 7½ ins. Price, $1.

The mammoth manufacturing companies of to-day with their great staffs of specialists possess exceptional opportunities for bringing out valuable publications relating to their products. Some of the publications thus issued have become so favorably known that they are now standard books of reference despite their trade origin. Of a kind with these is the wire and cable handbook which the Standard Underground & Cable Company publishes from time to time and of which the seventeenth edition has been just issued. Owing to the great expense incurred in preparing this publication, free copies are being sent only to the customers of the company.

The new handbook differs from former ones in having a greater number of illustrations, numerous half-tones in place of line cuts, a very large amount of text relating to subject matter not previously touched upon, and in having all text relating to the same subject matter re-written, revised and brought up-to-date. The book, as a whole, is divided into six sections: Price list; telegraph code; description of products; working directions; testing directions, and general and electrical data.

The first section is almost entirely for use of customers and for persons contemplating the purchase of cable. The telegraph code is perhaps of little more general interest on account of the scarcity of telegraph codes covering such ground. The third section is devoted in large part to description of the company's own products, but in various places throughout the text there is information which applies to wires and cables in general.

The fourth division, namely, working directions, gives suggestions and instructions for the installation of conduit and cable systems, not only taking up the design, but also the details in connection with the actual installation. This section should be of great interest to engineers who are laying out conduit and cable systems as well as to those in charge of the construction. The fifth section discusses small conductor cables giving information relating to tests for open and cross-wires and for tests on insulation resistance and electrostatic capacity. It also treats of the usual tests on power and light cables.

The last section, namely, general and electrical data, has so much information of general nature included that it is rather difficult to pick out that which will prove of most general interest. The pages noted below, however, will give some idea of the nature of the contents.

On pages 173 to 176, inclusive, are data relating to size of conductors for single-phase and multiphase systems, including a table of reactances; on page 177, a table of charging currents; on page 178, a table of sparking distances giving the results of a long series of tests by Henry W. Fisher; on pages 180 and 181, a valu-

able table giving relative insulation resistances and the relative electrostatic capacities of cables of practically any size and insulation; on page 182, data relating to insulation resistance and electrostatic capacity of various mediums, with change of temperature; on pages 192, 193, 194 and 195, data relating to the current and energy carrying capacity of electric light and power cables, used in underground conduits, which should be of the very greatest service to engineers designing conduit and cable systems; on page 195, data concerning the inter-relation of capacity of multi-conductor cable; some very interesting information compiled from a number of different sources on the properties of lead which enters so largely into the manufacture of underground cable, and important facts on rubber; on pages 196 to 202, relative cost of underground and aerial construction.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED AUG. 28, 1906

829,390. Trolley Harp; Benjamin L. Dresser, Uxbridge, Mass. App. filed Sept. 14, 1905. The trolley harp is made in two parts bolted to one another and having an intermediate channel by which they are engaged upon the trolley pole. Spring detents are provided for locking them in such relation.

829,403. Finger Contact for Electric Controllers; Francis E. Imeson, Thornaby-on-Tees, England. App. filed April 3, 1906. The finger has a wheel or roller at its extremity, the periphery of which is engaged by a blade spring to make the electric contact. The rotation of the roller insures a new surface, and carbon tips are provided to take the arc.

829,416. Third-Rail Insulator; John J. McGill, Chicago, Ill. App. filed Dec. 14, 1905. A cylindrical vitreous block is beaded at each end to receive specially formed malleable castings which are bolted around the beaded portions to form the base and the rail support respectively.

829,418. Track Cleaner; William A. McNair, Detroit, Mich. App. filed Oct. 30, 1905. All of the cars are designed to be equipped with a snow plow hinged at its central portion so as to be capable of throwing all the snow to one side, or throwing it on both sides as desired.

829,446. Derailing Device; Owen J. Travis, Denver, Col. App. filed April 26, 1906. A flange plate is pivoted on a vertical axis adjacent to the rail so as to swing horizontally over the same when desired.

829,557. Motor Suspension; John E. Webster, Pittsburg, Pa. App. filed Jan. 3, 1906. An improvement in "nose" suspension for motors by means of which the usual projection on the motor frame is spring impelled downward against the cross beam to prevent any backlash.

829,606. Railway Signal; Robert J. Sheehy, New York, N. Y. App. filed May 5, 1903. A form of signal system having the usual insulated block sections, and so arranged that the proximity of trains, either approaching or following each other, is indicated for either direction of travel without the use of any electrical conductors between blocks except the rails upon which the trains run.

829,630. Switch; Roy V. Collins, New York, N. Y. App. filed July 13, 1903. A mechanical movement by which a switch point is positively moved, first in one direction and then in the other by successive actuations of a power solenoid. Has two specially slotted cam plates which co-operate with one another by movements in two directions.

829,641. Trolley Harp; David J. Etly, Pittsburg, Pa. App. filed Dec. 13, 1905. The trolley harp has a pair of spring plates projecting upward therefrom on either side of the trolley wheel so as to be depressible when passing guy wires, hangers, crossings, etc.

829,675. Street Car Fender; Ernist H. Schulze, Kansas City, Mo. App. filed Jan. 27, 1906. A supplemental fender is provided in the rear of the usual fender and normally held in raised position by a detent. When the main fender engages an object the supplemental fender is automatically dropped.

829,783. Block Signal System; Max R. Hanna, Schenectady, N. Y. App. filed March 10, 1905. Designed for use with signal systems where the power circuit is alternating and the signal circuit is direct current. In order to avoid disturbance of the signals by stray alternating currents, the patentee has small motors for signal relays, the poles of which are circumscribed by copper rings which act to choke off any flux produced by the alternating magnetomotive force from the power current, but which have no effect on the flux due to the signal current.

829,794. Controller; Hermann Lemp, Lynn, Mass. App. filed Dec. 18, 1905. The controller has a stop to limit its throw in either direction so that it will not be intentionally moved to braking relation, but a button on the handle is provided to make this stop ineffective when desired.

829,822. Trackless Trolley; Montraville M. Wood, Schenectady, N. Y. App. filed Feb. 23, 1905. The vehicles draw after them, by a flexible cord connection, small carriers which run on the trolley wire. When the two vehicles meet and pass one another the carriers are interchanged, so that no two carriers ever pass one another on a single wire.

829,842. Kinetic Solenoid; Benjamin F. Carpenter, Roselle Park, N. J. App. filed May 12, 1904. The power solenoid has a loose joint connection with the switch point so that the solenoid has a certain movement before the resistance is felt, and imparts a hammer blow to give greater efficiency.

829,845. Fluid Pressure System; Fred B. Corey, Schenectady, N. Y. App. filed Feb. 2, 1903. When the main switch is thrown by the automatic devices controlled by the reservoir pressure, a valve is opened admitting air to a special cylinder which actuates a starting rheostat for the motor.

829,861. Supplemental Car Step; Arthur F. Elkins, Ironton, Ohio. App. filed Dec. 13, 1905. The lower step is carried by the piston of a downwardly acting pneumatic cylinder.

829,864. Safety Indicator for Elevators and Traction Cars; Robert H. Gaylord, Pasadena, Cal. App. filed Sept. 29, 1905. In order to warn passengers against entering a car when the same is about to start, the patentee has semaphore signals at the gates which drop the instant the power current is turned on.

PERSONAL MENTION

MR. C. V. MILLS, formerly general manager of the Chester Traction Company, of Chester, Pa., has been appointed manager of the Union Electric Construction Company, of Philadelphia.

MR. JOHN N. AKAMAN, general passenger agent of the Public Service Corporation of New Jersey, has been appointed general superintendent of the South Jersey division of the company, with headquarters in Camden.

MR. ROBERT DITTENHAVER, of Toledo, formerly passenger and freight agent of the Toledo & Indiana Railway and later with the White Star Line, has been appointed auditor of the Ohio Central Traction Company, of Galion, Ohio, succeeding Mr. A. T. Long, who resigned on account of ill-health.

MR. THEODORE STEBBINS, formerly general manager of the Columbus, London & Springfield Railway Company, is to take an extensive trip in South America in the J. G. White interests. He will visit Jamaica, Colon, Panama, Lima, Lake Titicaca, La Paz, and probably also Santiago, Valparaiso and Buenos Ayres. He will be accompanied by Mrs. Stebbins, and expected to sail from New York on Sept. 7.

MR. M. F. WESTOVER, secretary of the General Electric Company, is interested in the organization of the Adirondack Murray Memorial Association, of which he has accepted the secretaryship. The objects of the association are the erection of a monument to the late Mr. Murray at his burial place, and in other ways to perpetuate his memory. Any one can become a member by the payment of a small fee.

MR. J. MANCHESTER HAYNES, for years identified with the business and political history of Maine, died Sept. 1, after a long illness, from a complication of diseases. He was sixty-seven years old. Mr. Haynes was president of the Augusta Trust Company, president and promoter of the Augusta, Gardiner & Hallowell Electric Railway, and a director of many other Maine companies. He was interested largely also in shipbuilding. In 1879 Mr. Haynes was president of the Maine Senate, and in 1882 he was Speaker of the House of Representatives. He was a delegate to the Republican National Convention which nominated Blaine and Logan in 1884. He leaves a widow and three children.

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BACK COPIES.—No copies of issues prior to September, 1904, are kept on sale, except in bound volumes.

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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal, 8200 copies are printed. Total circulation for 1906 to date, 302,300 copies, an average of 8170 copies per week.

Drafting in Repair Shops

The practice of street railways in locating drafting departments varies widely, particularly with reference to the drawing required for the execution of shop work. On some systems the drafting force is established in the general offices of the company in the business district; on others drawing is performed wherever it may be needed at the time, and generally on a table in the office of the shop superintendent or foreman. The latter course usually results in direct personal contact between the draftsman and the shop, and it often saves time; but unless all the drafting is ultimately brought under the control of a centralized department there is great danger of sketches and prints going astray when they are most badly needed.

It is a poor plan to lay down a hard and fast rule that all drawings for shop service should be turned out in the general offices of the company, for there are many occasions where a rough pencil sketch on an old piece of board is all that is needed to enable a piece of work to be pushed at once to completion. Then, too, a small blue-printing outfit is often a great convenience in the repair shop, and a layout of this kind with a couple of braced channel irons extending from the shop window to enable a carriage to be run in and out is the means of saving no little time in emergency work. It is doubtful if it really pays to do much general drafting at the shops unless the engineering and drafting departments as a whole are located there, but special odds and ends may be very nicely handled by a shop assistant if the requisite designing ability is present. Too great insistence cannot be laid, however, on the preservation of all actual construction drawings in the main drafting department or sub-department on standard sheets well indexed and properly filed.

Brakes and Skidding

One article and one communication in this issue are devoted to the subject of braking. The letter from Mr. Hunter first calls attention to the fact that any of the older brakes, even the old-fashioned spindle hand brake, can be so arranged as to apply the same pressure to the brake-shoes as any of the more improved forms of brakes. From this the author forms the deduction that the principal difference between the two classes of brakes, so far as their action is concerned, is in the time required to bring the shoes into contact with the wheels and to stop the car. Hence the chief difference lies in the length of the so-called "danger space" in front of the car. The letter then brings out the interesting condition that a shorter danger space does not necessarily, or in fact usually, result in a reduction in the number of accidents, because both motormen and the public soon learn to apply to the shorter distance the precautions which they formerly took with the greater space when the cars could not be stopped so promptly. The use of power brakes is, of course, to be recommended, whether they are operated by air, momentum or electricity or by the device of multiplying the strength of the motorman by gearing or cams as adopted on a number of roads, but according to Mr. Hunter, the advantage of these power brakes lies in the higher running speeds thereby made possible, rather than in any probable reduction in the number of accidents.

The article by Mr. Fox takes up another phase of the subject and describes the relation of braking to skidding. The progress in braking in this country so far has been largely to quicken the application of the brake-shoes to the wheels, and hence to install powerful and easily controlled braking ap-

paratus. This policy is based upon the fact that in this country the rails are generally in a dry and clean condition. English roads, however, have a different condition to face, and, as Mr. Fox says, it seems strange to us to hear of engineering authorities abroad looking upon hand brakes as too powerful and upon air brakes as positively dangerous. The result has been the application and development in Europe, particularly in England, of a method of braking initiated in this country but not subsequently followed up here to any great extent.

Undoubtedly the track brake in its various forms, but particularly when the adhesion can be increased by magnetic means, is most useful on steep grades with slippery or greasy rails. In ordinary braking it is tacitly assumed that the wheels will not skid, since practically all braking devices are arranged to act directly or indirectly upon them. The tests given in Mr. Fox's paper are ostensibly upon electric brakes, but really their importance is not in showing the virtues of any particular means of applying power, but in putting upon record the difference between wheel braking and wheel braking plus track braking. It quite goes without saying that a powerful track brake is capable of slowing down a car rapidly, and experience seems to show that it also works fairly smoothly, a condition of great importance to the safety of the passengers. In some of the tests with the type B brake the retardation reached nearly 7 miles per hour per second. This is a figure so high as to be positively dangerous to the live load, and of course never to be used save to avoid a worse danger. The fact that with a proper track brake the retardation can be pushed up to the limit of safety is certainly important. Under favorable conditions air brakes on the wheels can produce all the retardation that is safe. If, however, the track is in bad condition, even the hand brake will skid the wheels, while the track brake can still get its grip.

The regenerative feature in some electric brakes seems to be regarded abroad as a feature of importance. Here it has never appealed to the street railway managers, and although the electric brake has been put out in several forms it has never fairly caught public attention. These foreign tests should bring it to the front again with the track brake attachment, although on account of our drier climate the need for braking other than on the wheels is probably not as great as an average condition of American practice as it is abroad. Nevertheless we believe that the tentative trials of these brakes outlined in the article referred to have been encouraging, and further work in this line will certainly come. The real significance of the whole matter is in the track brake as an additional safety device at certain times and under certain conditions. Even then there is no royal road to safety in electric railroading. With a slippery rail and a steep grade, only persistent inspection and attention to the details of equipment and discipline can keep down the accident list. The test brakes cannot promise immunity when motormen take long chances. They can, however, materially lessen the dangerous space on unfavorable track, and this we believe to be very advisable, in spite of the experience of the claim agents mentioned in Mr. Hunter's letter.

The Use of Poor Fuel

The final test of economy in station operation is the cost of fuel and firing per unit of energy. It is easy to find steam and electric plants of the latest type, laid out by the most sacred canons of efficient design, which yet fail to show any conspicuous economy when one takes account of the inroads on the coal pile. With the increasing cost of fuel it is necessary not only to use steam economically, but to generate it at the lowest possible cost for fuel. The day of burning high-grade coal in manufacturing establishments has well-nigh passed, and it is time to investigate the economics of poor bituminous coal and of low-priced anthracite tailings and refuse. Anything that contains a reasonable proportion of carbon can be made to burn on sufficient provocation, and while the labor of stoking and providing draft is greater with poor fuel than with good, it by no means offsets the considerable difference in price. The fact is that the thermal values of fuels differ very much less than their prices, and a proper degree of skill can effect large economies. The change from high-grade to low-grade fuel may involve considerable cost in change of furnace equipment, indeed the conditions must be radically altered, yet in the long run the change will often pay very handsomely.

To put the matter in concrete form, one gets from the best bituminous or anthracite coal about 13,000 to 15,000 B. T. U. per lb. From low-grade bituminous coal or cheap buckwheat anthracite one gets say 9000 to 10,000 B. T. U. per lb., these fuels containing more slate or other mechanical refuse and giving more ash. The present prices of such fuels vary not in the implied ratio of about 2 to 3, but more nearly as 1 to 2, so that the cheap fuel actually contains 30 to 40 per cent more thermal capacity per dollar of cost. Even culm is a fuel not to be despised where it can be had without the payment of extortionate freight charges. Many plants use slack and slack mixtures to advantage now, and if more attention was paid to the subject of furnaces, plants could profitably change to the supposed lowest grades of marketable fuel with good effect on the balance sheet. The secret of burning cheap fuel is of course in the design and management of the furnace. Poor coal, whether bituminous or anthracite, carries many impurities and gives much ash compared with high-grade coal, so that it is more difficult to burn cleanly and requires altogether more careful treatment. If finely comminuted like buckwheat coal or some of the bituminous waste it also requires a very special class of grate, much smaller in its apertures and more liberal in its available surface than those more commonly in use. There being smaller natural interstices in the burning pile of fuel, more draft is required, and particularly with the small anthracite coal a steam draft seems to work better than a dry blast. Dumping and shaking grates are also extremely useful in keeping up a uniform fire and facilitating cleaning, indeed the chief requisite in firing such fuel seems to be a thin and even fire forced to high temperature with plenty of well-distributed air. Mechanical stokers would seem to be particularly appropriate for handling poor coal, although most of the forms in use have not been specialized to the degree requisite for working the poorest grades.

There is a great opportunity for making judicious fuel mixtures of cheap materials. A low grade bituminous slack uncomfortably rich in volatile matter may be blended with buckwheat anthracite to make a mixture of well-balanced composition for easy burning, having almost as great thermal value as high-grade steam coal at far less cost. Such a mixture can be made, save for rather higher ash, to approxi-

mate very closely to the composition of the best steam coals, and if one works with large supplies can be kept exceedingly uniform in performance. The day has come when these so-called low-grade fuels should be utilized on a large scale. A mixture costing perhaps $2 to $2.50 per ton can be made to do the work of market coals costing half as much again, provided the fireroom is planned for the purpose. In building new plants it is certainly the part of wisdom to prepare for this instead of working on the tacit assumption that fairly high-grade fuel is to be used. We have very seldom seen a specification drawn in which due stress was laid on the adaptation of the boilers and furnaces to economical fuel. A boiler guarantee based on picked New River coal is very pretty to look at, but it is not business. In fact, a boiler and furnace showing high evaporation with such fuel is likely to give a disappointment in capacity and economy when used with cheap coal. It would not be a bad plan in laying down a specification for a power plant to call not for solemn guarantees in details, but for consumption of a specified grade of fuel per kilowatt-hour. Few power plants show up as they should on this basis. They may give all kinds of economy in the generating units and yet do badly upon the whole. Given a good load factor such as can be reached in most large stations and one must look for savings quite outside of the generating units. Keep an eye on the fireroom and the piping and the auxiliaries and the bills will be smaller.

Construction Work in Established Power Plants

Sooner or later the power plant on every growing electric railway system comes face to face with the problem of enlarging its capacity. In a good many installations the physical limits of the land occupied precludes any extension of equipment beyond the original layout, and increased capacity can be had only at the expense of tearing out a great deal of old machinery and setting up new apparatus in its place. This is always a relatively costly proceeding, for it rarely happens in these days that the foundations of the original equipment are at all suited to the design of the later styles of machinery. A greater or less obstruction of the regular work of the power plant is part of the price which has to be paid for remodeling, and it is important that when alterations are under way the regular service shall be interfered with as little as is possible.

Strictly speaking, the time to insure a minimum interruption of service in a plant during extensions is when the original design is made. Of course, this is as much out of the question in a good many plants as it is for a man to select his own grandparents, but in newly planned installations, it ought not to be such a difficult proposition to bear in mind the question of facility of extension before the hodcarriers begin to travel up and down the ladders or the concrete mixing gang begins to turn up its batches and put together the forms. Plants constructed on the so-called unit principle—where each group of boilers and engines, turbines, pumps or producers constitute in reality a separate operating station focussed upon a common set of bus-bars—offer many advantages both in economy of first cost and convenience of enlargement when increased capacity is needed. It is only the story of the sectional bookcase over again on a much larger and different scale. A station filled with heterogeneous machinery is a much harder field for expansion than a duplicated unit or similarly equipped installation. Therefore if the probable line of extension of a plant is known at the time when it is built, it is wise to provide for the future in such a way that tearing out will not be necessary unless some compensating advance in the science of motive power production relegates all the established equipment to the scrap heap.

Certainly no plant should undertake elaborate extensions without separating, as far as possible, the operating and the construction work. It is better to bring all the materials and machine parts into the plant at the opposite side from the working portion, even if this in some cases demands knocking a hole in the wall for a new doorway. We have seen plants all torn up with parts of machines and construction litter, tools and debris, which might have been largely avoided if the work had not all been carried through the engine room past operating apparatus to temporary resting places in aisles or other places on the wrong side of the building. A traveling crane or hoist of some description is almost invaluable in the work of adding to a power plant, and yet this useful device is often employed to the serious interference of the regular operating shifts. A great deal of such work is performed by outside contractors, but with a proper supervisory clause in behalf of the railway company, it should not be difficult to secure the adoption of the best methods of handling material, with respect to the good of the existing installation. At such times the equipment which is in operation is subjected to unfavorable conditions in regard to stone or metal dust, leakage of water, dirt, accident by collision with tools, materials or moving pieces of machinery being handled by the crane. Then again, the extension of a plant often means that the old equipment has to be considerably overloaded pending the establishment of the new machinery in regular operation, so that interruptions are more than ordinarily serious.

As far as possible, materials should be kept outside the immediate operating rooms, even if it is necessary in some cases to hire space on adjoining property for a short time. The men on duty should be free to move about quickly, and in case it becomes necessary to obstruct the vision of the switchboard attendants by the erection of staging or other false work, temporary telephones can be installed at various points, or at least electric push-button signals inaugurated. Sometimes a great deal of annoyance is saved by the suspension of a thick series of canvas curtains from the roof trusses so as to create a temporary partition between the operating room and the power plant extension. Sufficient care is not always observed in regard to covering up small machinery which is standing idle, to protect it from the dirt and dust of construction. An extra use of the air blast cleaner should be encouraged at such times, and it is a question if the use of a vacuum cleaning system is not desirable when so much dirt and dust is flying about in the air. Unless careful precautions along these general lines are taken when a plant is extended, it is by no means impossible that the cost of making alterations and improvements may be much increased, although the immediate expense of this sort of depreciation is hidden. Sometimes an extension can be made on the outward side of a wall, the latter remaining in place until the bulk of the work is done. A minimum of interference is then probable, and if the unit principle of construction is employed, the regular force in the plant may be almost as little hindered by the work as are passers-by on the adjoining streets.

BRIDGES FOR ELECTRIC RAILWAYS—I

By C. C. SCHNEIDER, Consulting Engineer

The recent development of electric railways has made them a very important factor in our modern systems of transportation, and created a demand for structures expressly designed to carry electric railway traffic only. This is the class of bridges which will be considered in this article, confining ourselves to steel structures only.

Bridges for electric railways do not differ much in their essential features from regular railroad bridges, except that the live loads to be carried by them are smaller and, therefore, do not require such heavy structures, and, on account of this difference, they require special treatment. Rigidity is one of the most essential requirements of a well-designed structure. A railroad bridge, owing to the nature of the traffic it has to carry, requires heavy members and connections, and this massiveness alone imparts considerable rigidity to the structure. On the other hand, a bridge carrying an electric railway is generally a much lighter structure and has not the natural advantage of that rigidity produced by its own weight; the same must, therefore, be obtained by the design.

The designing and building of a bridge or any other structure on the strength of which human life depends cannot be too well or carefully done. In accordance with the writer's experience and observations, electric railway bridges generally are not designed with the same care as railroad bridges. They are, as a rule, treated like county highway bridges, carelessly designed, sometimes by incompetent men, and built in shops fitted up to do only the ordinary class of highway bridge work. All over the country may be observed a number of flimsy structures of this kind, which will soon be worn out and will have to be replaced by more substantial ones in the near future. True economy, therefore, demands carefully prepared designs, good workmanship and good material.

SELECTION OF A DESIGN

The kind of structure which is best adapted for a particular crossing depends upon local conditions, such as the shape of the profile, the width and nature of the stream, river bottom, and the material of the approaches. If a structure is to span a valley with only a small creek, a viaduct consisting of braced steel towers and plate girder spans is generally the most suitable structure. If the viaduct, instead of crossing the valley, is located in the streets of a city where the tower bracing would interfere with the traffic in the street, this bracing has to be omitted and the spans supported on columns in which brackets take the place of the bracing to insure lateral stability. Structures of this kind are known as elevated railroads.

SCHUYLKILL RIVER BRIDGE AT FALLS OF SCHUYLKILL, PHILADELPHIA, PA.

Structures crossing a river may consist of one span, the ends being supported by abutments on the shores, if the stream is small, or a number of spans, with piers in the river, if the width of the river is greater and the nature of the stream will admit building such piers. The lengths and number of spans which give the best results for any particular crossing depend upon the cost of the sub-structure, and will be considered later in this article.

In all cases where it is practicable to put temporary supports or falsework in the river on which to erect the superstructure of a bridge, or where conditions are favorable for erecting the spans on scows near the shore and float them in place, bridges up to at least 700 ft. length should consist of simple spans of plain, substantial plate girders, lattice or pin-connected trusses. Where the nature of the stream or requirements of navigation make it impracticable to erect the

superstructure on temporary falsework, and the conditions are unfavorable for floating the spans in place, some type of structure must be selected which can be erected without such temporary supports. The structures which can be erected without the use of falsework are: Cantilever bridges, suspension bridges, and such other types as can be erected on the cantilever principle.

CANTILEVER BRIDGES

For moderate spans, cantilever bridges are, under ordinary conditions, uneconomical and inferior in rigidity as compared with simple spans. They should be generally used for long spans only, or in cases where the conditions are such as to make any other type of bridge impracticable. Cantilever bridges have been built in many places, where simple trusses could have been erected more economically, and therefore the latter would have been more appropriate in their places. In some cases it is possible to design simple truss spans so that they can be erected on the cantilever principle, which should be done where the conditions make it practicable. For instance, in the case of the double-track cantilever bridge over the Monongahela River, with a clear span of 800 ft., the cantilever type was the most appropriate, in fact the only practical design which could have been selected in order to comply with the requirements and local conditions and also for economy.

SUSPENSION BRIDGES

Suspension bridges of the usual type are generally not to be recommended, as they lack that rigidity which is essential in a first-class bridge for railway traffic. Special types of suspension bridges with eye-bar chains and spandrel braced stiffening trusses can be designed so as to produce a structure rigid enough for railway traffic.

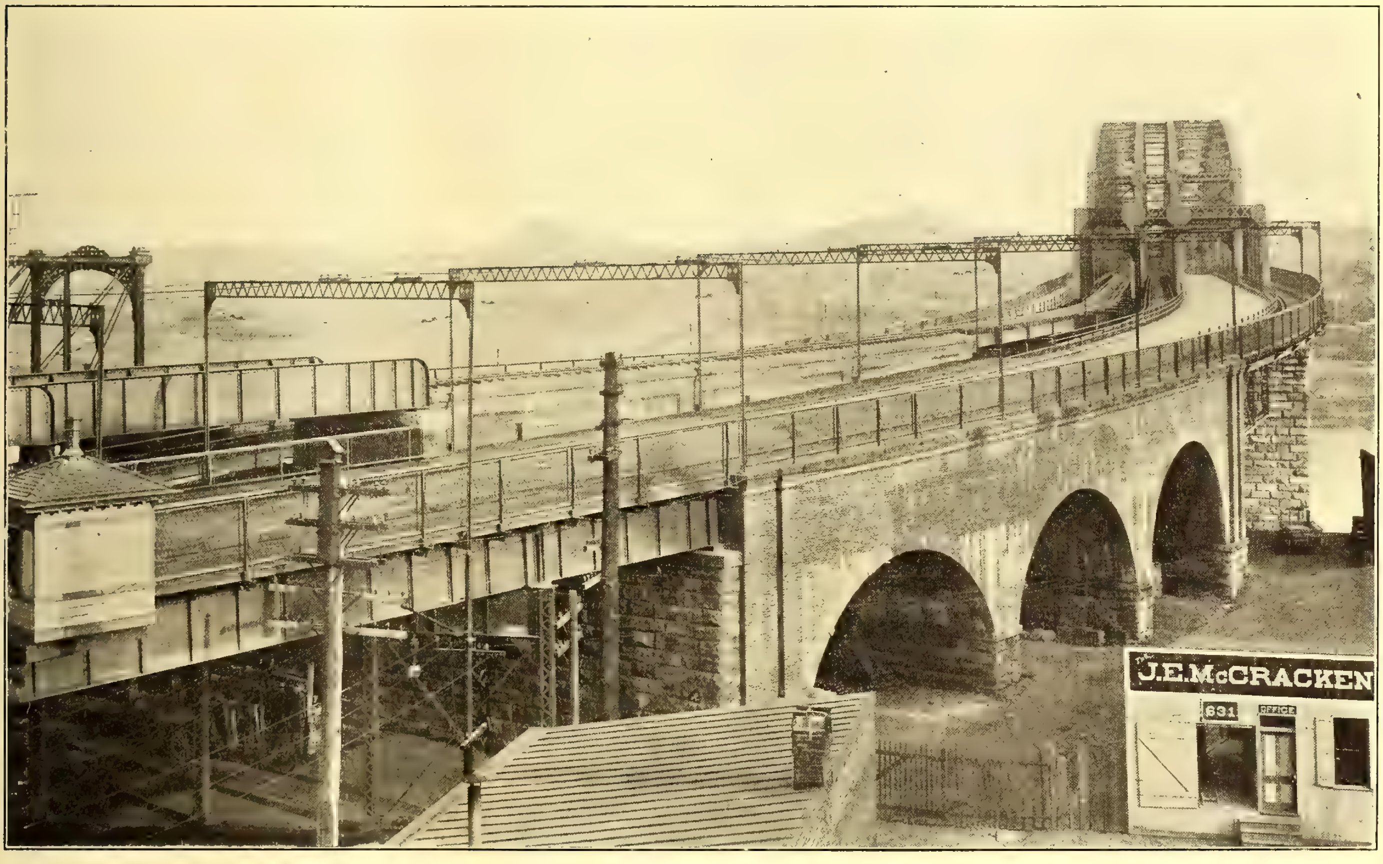
THE ARCH BRIDGE

The arch bridge is also one of those types which can be erected without falsework in certain locations. The steel arch is to be recommended in all cases where conditions are favorable as being economical as well as on account of the graceful appearance. The locations favorable for such an arch are where nature has already provided the skewbacks for the same, viz.: where the shores on both sides of the river consist of solid rock and rise considerably above the surface of the water, as is the case of the site of the Niagara Falls and Clifton Bridge. This structure also had to be erected on the cantilever principle. This arch has a span of 840 ft. between centers of pins, and is therefore the largest span of its kind in the world.

MOVABLE BRIDGES

If a bridge crossing a navigable stream is not high enough above the water level to provide the necessary clearance for the requirements of navigation, it becomes necessary to construct a movable bridge. There are various types of movable bridges, but the two principal types which have proved satisfactory in practice, and therefore have come into general use, are swing bridges and lift bridges.

The swing bridge generally consists of a continuous span over two openings, the center of which rests on a turntable supported by a pier. The ends of the span are also supported by piers when the bridge is closed. To open the channel for navigation the end supports are removed and the bridge turned around its center by means of the turntable, thus providing generally two openings which will allow two vessels to pass in opposite directions at the same time. The turntables are either rim-bearing or center-bearing, and sometimes a combination of both. The swing bridge with center-bearing turntable for ordinary spans under ordinary conditions has proved more satisfactory and given less trouble in operating than the one with rim-bearing turntable. The former requires less power to operate, and when closed is more like a continuous span on three supports than the latter, as then the ends as well as the center rest on fixed supports. Many



OHIO RIVER BRIDGE BETWEEN NEWPORT, KY., AND CINCINNATI, OHIO

swing bridges with center-bearing turntables have been built and are in successful operation up to 350-ft. span for double and up to 500-ft. span for single-track bridges.

Lift bridges are generally used for small spans, where the local conditions are not favorable to a swing bridge. There are two types of lift bridges in general use, viz: the bascule bridge, which rotates in a vertical direction either around a pivot or rolls on a circular segment, and the ordinary lift bridge, which is lifted up bodily. Bascule bridges have proved very unsatisfactory for spans up to about 200 ft. For small spans one leaf is used, but for spans over 100 ft. they are generally composed of two leaves, the ends of which are locked together in the center when closed.

The ordinary lift bridge which is raised with chains or wire ropes from a tower at each end is sometimes used successfully for a crossing over a narrow canal, where it has to be raised only enough to let canal boats pass, but it is not to be recommended for long spans, or where a high lift is required.

BRIDGE OVER THE CONNECTICUT RIVER AT NORTHAMPTON, MASS.

RICHARDSON STREET BRIDGE, NEWTONVILLE, MASS.

NORFOLK & WESTERN RAILROAD COMPANY'S BRIDGE AT KENON, W. VA.

ECONOMICAL LENGTH OF SPAN

In many cases the location of piers and lengths of spans to be used in a crossing are determined by local conditions, but in cases where the local conditions admit of a choice, span lengths should be selected that are most economical. The total cost of a bridge at any particular crossing must include both the cost of the superstructure and the sub-structure. Generally the cost of sub-structure and superstructure should approximately balance each other. For steel viaducts consisting of braced towers and plate girder spans, the economical span length is obtained when the cost of the pedestals and towers are equal to the cost of the spans. It has proved economical to make the tower spans shorter than the intermediate spans, the usual practice being to make the latter approximately twice the length of the former. For low viaducts up to about 50 ft. or 60 ft. high, spans of 25 ft. and 50 ft. may be used; but for greater heights, 30-ft. and 60-ft. spans are to be recommended. For very high viaducts it is, on account of the stability of the towers, advisable to use longer spans. It is considered good practice to make the distance between the two bents forming a tower not less than one-fifth of the height of the tower.

In some cases there may be a small saving in weight if longer spans between the towers, than double the lengths of the tower spans, are used, but for practical reasons it is not advisable to do so. If the intermediate spans are not over twice the length of the tower spans, the same depth of girders can be used for both, which will simplify details, reduce the cost per pound of the steel work, and improve the appearance of the structure. It is also not advisable, excepting where conditions require it, to make intermediate spans over 80 ft. on account of the increased cost of erection. Therefore, 40 ft. and 80 ft. may be considered the practical maximum spans for viaducts under ordinary conditions.

In laying out the spans of a viaduct, it is not advisable to make every span conform to the theoretically economical length, but a uniform span length should be maintained throughout, as much as possible, more particularly in the tower spans, in order to reduce the cost per pound of the

steel work. Duplications of parts always reduce the cost.

For low viaducts, where the floor is carried on single column bents without braced towers, such as elevated railroad structures, spans from 45 ft. to 50 ft. have proved the most economical. For bridges crossing a river, the spans of which are supported on masonry piers, the greatest economy will be obtained when the cost of the sub-structure is equal to the cost of the superstructure without the floor system; or in other words, the cost of one pier should equal the cost of the trusses and lateral system of the span. The cost of the floor system, which is approximately a constant quantity per lineal foot for a particular loading, has therefore no influence in determining the economical length of span. In doubtful cases, particularly with difficult and expensive foundations, it is always safer to make the spans longer, as the cost of the superstructure can be more closely estimated than that of uncertain foundations. In laying out the spans for a particular crossing, it should be borne in mind that what has been said in reference to viaducts also applies to bridges, viz: that uniformity and duplications of spans will reduce the cost of the superstructure.

Skew spans should be avoided wherever it is possible. If a skew span can be avoided by increasing the length of the same it will be in the line of economy as well as good practice, as the extra cost of the skew piers or abutments will generally balance the increased cost of the span. Skew spans, no matter how carefully they are designed, cannot be made as rigid nor have the same lateral stability as square spans.

The construction of masonry and foundations will not be considered in this article, being a subject generally well understood by all experienced engineers in charge of railway construction. However, to assist engineers in making approximate estimates of the cost of sub-structures, it was deemed desirable to give some data in reference to dimensions of masonry piers.

The top dimensions of a bridge pier and bridge seat of an abutment are generally determined by the size and position of the bed plates or pedestals. If there is sufficient room on top of the pier for the bridge seat, the pier may be considered safe for ordinary conditions. The usual practice is to have the masonry on top (under coping) project 3 ins. in the direction of the thickness of the pier and at least 6 ins. in the direction of the length of the pier beyond the edges of the bed-plates. The thickness of piers and abutments under coping should not be less than 4 ft., and the thickness of the parapet or back wall of abutments not less than 2 ft.

APPROXIMATE DISTANCES BASE OF RAIL TO MASONRY.

Span in Feet C. C. Bearings	Deck Plate Girder Spans: Class A, Depth of Web	Class A, B of Rail to Msry.	Classes B and C, Depth of Web	Classes B and C, B of Rail to Msry.	Through Girder Spans, Base of Rail to Masonry: Class A	Classes B and C
	ft. in	ft. in.	ft. in.	ft. in.		
15	1 9	2 6	1 3	2 0		
20	2 0	2 9	1 9	2 5		
25	2 9	3 6	2 0	2 9		
30	3 3	4 0	2 6	3 3		
35	3 9	4 6	3 0	3 9		
40	4 3	5 0	3 6	4 3		
45	4 9	5 6	3 9	4 6	3' 0"	2' 6"
50	5 3	6 0	4 3	5 0		
55	5 6	6 3	4 9	5 6		
60	5 9	6 6	5 0	5 9		
65	6 0	6 9	5 6	6 3		
70	6 3	7 0	6 0	6 9		
75	6 6	7 3	6 3	7 0		
80	6 9	7 6	6 9	7 6		
85	7 3	9 6	7 3	9 3		
90	7 6	9 9	7 6	9 6		
95	8 0	10 3	8 0	10 0	4' 4"	3' 6"
100	8 3	10 6	8 3	10 3		

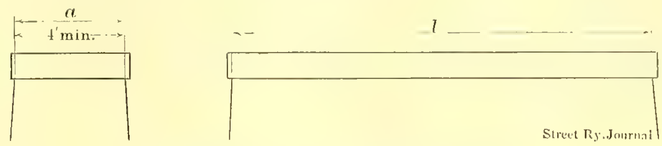
For through lattice and pin spans over 100 c. to c. the approximate distance base of rail to masonry will be 5' 0" for Class A and 4' 0" for Classes B and C

The following tables give the approximate minimum dimensions of piers and abutments for different spans and classes of bridges; the thicknesses of the piers are determined with the assumption that one pier supports two spans of approximately the same length. For piers supporting only one span, the dimensions given for the bridge seat of the abutment should be used. The dimensions given in the tables refer to three different classes of bridges designed for the different kinds of traffic designated in the specifications as:

Class "A" loading for heavy traffic.

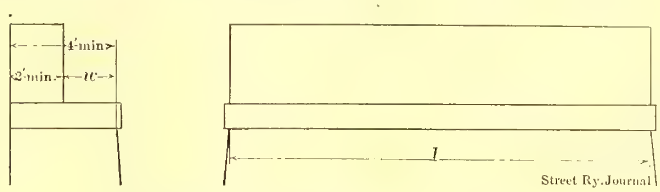
Class "B" loading for medium traffic.

Class "C" loading for light traffic.



DIMENSIONS OF MASONRY PIERS

Span	Thickness "a" Under Coping: Class A S. T.	Class A D. T.	Class B S. T.	Class B D. T.	Class C S. T.	Class C D. T.	Span	l = dist. c. c. trusses + figures in table: Class A S. T.	Class A D. T.	Class B S. T.	Class B D. T.	Class C S. T.	Class C D. T.
ft.	ft.in.	ft.in.	ft.in.	ft.in.	ft.in.	ft.in.	ft.	ft.in.	ft.in.	ft.in	ft.in.	ft.in.	ft.in.
25	4 0	4 0	4 0	4 0	4 0	4 0	50	3 6	4 0	3 6	3 6	3 6	3 6
50	4 0	5 3	4 0	4 0	4 0	4 0	100	4 0	5 0	3 6	4 0	3 6	3 6
75	4 6	6 0	4 0	4 6	4 0	4 0	150	4 6	5 6	4 0	4 6	3 6	4 0
100	5 0	6 6	4 6	5 0	4 0	4 0	200	5 0	6 0	4 0	5 0	3 6	4 6
125	5 4	7 0	4 0	5 4	4 0	4 4	250	5 0	6 6	4 6	5 0	4 0	4 6
150	5 8	7 6	4 3	5 8	4 0	4 8	300	5 6	7 0	4 6	5 6	4 0	5 0
175	6 0	8 0	4 6	6 0	4 0	5 0	350	6 0	7 6	4 6	6 0	4 6	5 0
200	6 4	8 6	4 9	6 4	4 0	5 4	400	6 0	7 6	5 0	6 0	4 6	5 6
225	6 8	9 0	5 0	6 8	4 3	5 8							
250	7 0	9 6	5 3	7 0	4 6	6 0							
275	7 4	10 0	5 6	7 4	4 8	6 3							
300	7 8	10 6	5 9	7 8	4 10	6 6							
325	8 0	11 0	6 0	8 0	5 0	6 9							
350	8 4	11 4	6 2	8 4	5 2	7 0							
375	8 8	11 8	6 4	8 8	5 4	7 3							
400	9 0	12 0	6 6	9 0	5 6	7 6							



DIMENSIONS OF MASONRY ABUTMENTS

Span	Thickness "w" of Abutments: Class A S. T.	Class A D. T.	Class B S. T.	Class B D. T.	Class C S. T.	Class C D. T.	Span	Length "l" = dist. c. c. trusses + figures below: Class A S. T.	Class A D. T.	Class B S. T.	Class B D. T.	Class C S. T.	Class C D. T
ft.	ft.in.	ft.in.	ft.in.	ft.in.	ft.in.	ft.in.	ft.	ft.in	ft. in.	ft.in.	ft.in.	ft.in.	ft.in.
25	2 0	2 2	2 0	2 0	2 0	2 0	50	3 6	4 0	3 6	3 6	3 6	3 6
50	2 2	2 9	2 0	2 2	2 0	" "	100	4 0	5 0	3 6	4 0	3 6	3 6
75	2 6	3 3	2 0	2 6	2 0	2 0	150	4 6	5 6	4 0	4 6	3 6	4 0
100	2 8	3 6	2 0	2 8	2 0	2 2	200	5 0	6 0	4 0	5 0	3 6	4 6
125	2 10	3 9	2 2	2 10	2 0	2 4	250	5 0	6 6	4 6	5 0	4 0	4 6
150	3 0	4 0	2 4	3 0	2 0	2 6	300	5 6	7 0	4 6	5 6	4 0	5 0
175	3 2	4 3	2 6	3 2	2 0	2 8	350	6 0	7 6	4 6	6 0	4 6	5 0
200	3 4	4 6	2 8	3 4	2 2	2 10	400	6 0	7 6	5 0	6 0	4 6	5 6
225	3 6	4 9	2 10	3 6	2 4	3 0							
250	3 8	5 0	2 11	3 8	2 5	3 2							
275	3 10	5 3	3 0	3 10	2 6	3 4							
300	4 0	5 6	3 1	4 0	2 7	3 6							
325	4 2	5 8	3 2	4 2	2 8	3 8							
350	4 4	5 1	3 3	4 4	2 9	3 10							
375	4 6	6 0	3 4	4 6	2 10	3 11							
400	4 8	6 2	3 5	4 8	2 11	4 0							

PRINCIPLES OF DESIGN

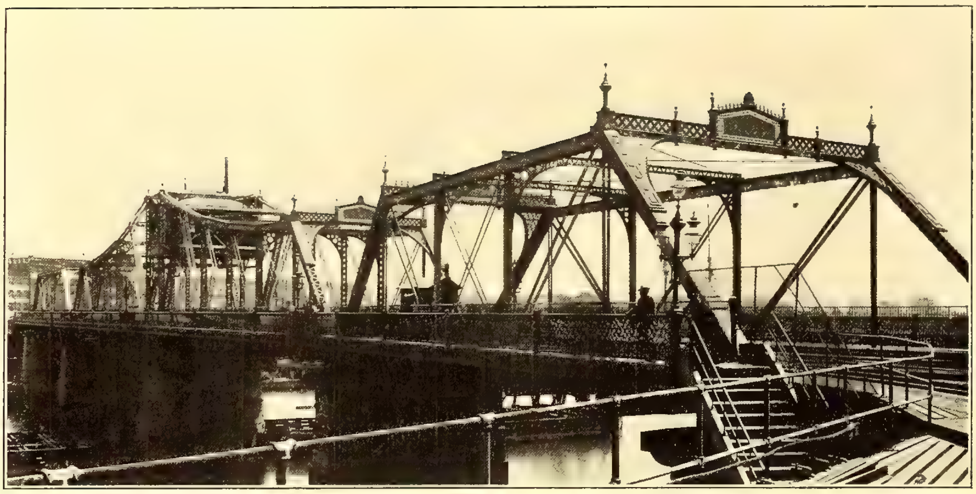
The fundamental principles upon which structures should be designed are embodied in the specifications appended to

this article. A brief statement of the general features required in a good design and a few practical suggestions, however, may be useful to guide the engineer who is not a bridge expert in selecting the best designs of those offered by competing bridge companies.

Simplicity and rigidity are the first fundamental principles of a properly and well-designed structure. A steel structure should have as few parts as possible, and these should be plain, substantial and straight, without any unnecessary bends, twists and crooks. This simplicity of design should apply not only to the main members of a structure, but also to all its details and connections.

A structure not possessing the necessary rigidify is subject to excessive vibrations under the traffic, and therefore will be short-lived and require constant repairs, and will prove a general nuisance to the engineer who has charge of the maintenance of the same. Rigidity should therefore be particularly insisted upon in all kinds of structures carrying electric railways.

To make a structure rigid, the members of trusses (excepting in spans of such length that their own weight will produce the necessary stability), should be so designed that they can resist compression as well as tension, or in other words, should be stiff members and be rigidly connected. All adjustable members should be avoided and all antiquated, impracticable contrivances, such as rods with screw ends, loops, wing plates, floor beam-hangers, turn buckles and clevises, which are sometimes used in lateral and sway bracing of bridges and viaducts, are bad practice and should be entirely discarded.



SECOND AVENUE BRIDGE OVER THE HARLEM RIVER, NEW YORK

Adjustable members with their gim-crack connections are flimsy and not as reliable as plain, substantial work, and in time become out of adjustment and have to be readjusted, which is very undesirable in a permanent structure. The ideal structure has no adjustable members, and if properly designed, when once erected needs little or no attention, excepting a coat of paint once in a while.

The most substantial bridge, combining simplicity and rigidity, is a plate girder, and should therefore be given the preference over all other designs for all spans up to its practical limits, which limits may vary under different conditions, such as the practicability of transportation and erection. If the lengths of the spans are such as to preclude plate girders, riveted lattice trusses should be used. In accordance with good practice they should be used for spans up to 150 ft. For longer spans, or in cases where the conditions are unfavorable for a lattice truss, pin connected trusses may be used.

All bridges carrying any kind of railway traffic should be designed not only to carry that traffic with safety, but also to withstand the ordinary contingencies of traffic, such as derailment, a broken axle, or a collision. Structures designed in accordance with good practice may be damaged by such accidents, but should be able to stand up without collapsing.

ESTHETICS IN DESIGN

Bridges and other structures carrying railway traffic are generally designed for utility. Strength and rigidity are of course the first considerations in any structure on the strength of which the safety of human life depends. While the writer does not advocate decorating structures with useless ornamentation, he is of the opinion that some consideration should be given to appearance, particularly in structures which are situated in prominent places or in public parks in the midst of beautiful landscapes. Such structures should be somewhat in harmony with their surroundings.

In looking at some existing structures, which on account of their situation should have been of a monumental nature, several of them being the most prominent objects in large cities, one is almost inclined to believe that some designers had taxed their ingenuity to make them as unsightly as possible. Some of these structural deformities are covered with tasteless decorations which do not improve their appearance, but tend to exaggerate the homeliness of their outlines. The prevailing notion that it requires an additional expenditure of money to give a bridge a pleasing appearance, and that good engineering and graceful outlines with artistic proportions do not go together, is erroneous, as the most ugly and unsightly structures in existence are those in the designs of which the fundamental principles of good engineering are violated.

The first principle of esthetics in a design are symmetry and correct proportions. A permanent structure should look just what it is supposed to be; it should have the appearance of permanency and strength, but not that of a temporary makeshift. Some of our elevated railway structures, located in the streets of a city, on account of which some attention should have been paid to their appearance, are particularly lacking in sightliness, not for lack of ornamentation, but because in their designs all principles of good engineering have been neglected. Good engineering consistent with economy requires plate girders for all spans up to 100 ft. Elevated railway structures composed of plate girder spans would certainly be a great improvement over those unsightly ones composed of lattice girders, having the appearance of temporary structures. The many intersecting members of their trusses are tiresome and offensive to the eye and take away the appearance of repose and stability contained in a plain structure of plate girders. Slovenly and ill-advised detail is another item which serves to spoil the appearance, while properly proportioned, well designed, neat-looking details not only enhance the appearance, but are the least expensive. Wherever brackets are needed for stiffness, they can be constructed so as to have strength as well as a graceful appearance without extra cost.

Why are some truss bridges so extremely unsightly? Be-

cause they are not proportioned in accordance with good engineering. Their depth is generally out of proportion to their length, thus, being composed of long, slim members, are lacking in stiffness and give to the truss a spider-web like appearance. Trusses with curved upper chords have a more graceful appearance than those with straight chords. For spans over 200 ft., good practice and economy require curved chords. Thus again good engineering corresponds with aesthetic designing. Metal arches, if properly designed, always have a graceful appearance and should be used in all cases where the location and surroundings are favorable, and are in the line of economy and good engineering.

A HERD OF ELEPHANTS CROSSING THE TUSCARAWA STREET BRIDGE AT CANTON, OHIO

MAINTENANCE OF STEEL STRUCTURES AND PROTECTION AGAINST CORROSION

The life of a steel structure depends: First, on the design, and second, on the care which is bestowed on its maintenance. A properly designed and constructed steel bridge needs very little care after it is erected. The most important factor in prolonging the life of a bridge is to have it well protected against corrosion as soon as it is erected, and continue to keep it well protected. Each bridge should be carefully examined from time to time by an intelligent and conscientious inspector. He should examine the details and test the rivets, especially those of the floor system, and determine when the protective coating should be renewed. The bridge should be repainted whenever the final coat becomes deteriorated and exposes the first field coat. In order to show more clearly when the bridge needs repainting, each coat should have a different color.

UNION RAILROAD BRIDGE OVER PENNSYLVANIA RAILROAD TRACKS AT BESSEMER, PA.

The kinds of paint recommended as the best protective coating are many and various, each manufacturer claiming special merits for his paint, and almost every engineer has his own opinion in this respect as well as his pet paint. The writer therefore refrains from expressing an opinion and from recommending any particular paint or composition; but his experience has convinced him that no substance has yet been discovered which can take the place of linseed oil.

Bridges over steam railroads or in other places where they are subjected to the corroding influence of the gases from locomotives or furnaces should be protected against those influences more thoroughly than can be accomplished by paint. Good results have been obtained by having the floor system and other exposed portions of the structures incased in concrete or reinforced concrete. As steel is practically an indestructible material, if kept from corrosion, there is no good reason why properly designed steel bridges, properly protected, should not last at least as long as stone bridges.

METHODS OF LETTING CONTRACTS FOR BRIDGE WORK

In letting contracts for bridges or other structural steel work, either of the following methods may be adopted by the railway company:

First: Prepare a complete survey plan and profile of the crossing, showing the location of the piers and abutments, their general dimensions (as far as they affect the steel superstructure), base of rail to masonry, distance between centers of track (if there is more than one), angle of skew and degree of curvature (if bridge is on a skew or curve).

Bids should be invited on the steel superstructure to be built in accordance with the engineer's plans and the specifications submitted therewith. In order to avoid trouble, it is advisable to invite only such manufacturers of structural steelwork as are known to the engineer to have proper facilities for doing the work satisfactorily.

The letter inviting proposal should state the kind of loading for which the bridge is to be designed, the time the work is to be completed, the kind of paint desired, where the steelwork is to be delivered, whether the railway company or the contractor will furnish floor bolts.

If bids are invited for the erection, it should be stated whether the bridge is on a new line or is to replace an existing one (in the latter case, the character of the same should be stated), and whether the contractor is to erect the steel superstructure ready for the ties or ready for the rails (the latter includes framing and placing of floor timbers); also if the field painting is to be included in the price of erection. The bidder should be requested to submit a price per pound for the finished steelwork, accompanied by an approximate estimate of weight. In order to have greater competition it is

advisable to ask separate bids, one for the steelwork delivered and one for the erection of the same, and to invite contractors who are not manufacturers of steelwork to bid on the erection. After the contract is awarded, the contractor for the steelwork should submit strain sheets and designs, which should be referred to a competent expert for examination and approval. After the design is approved the contractor will make shop drawings to correspond with the approved design, which should again be examined and approved by the railroad company's expert before any work is done in the shop.

Second: The railroad company employs a competent bridge engineer either permanently or temporarily as a consulting expert, to make complete designs for all structures, and invites proposals on the designs furnished by the railway company in a similar way to that recommended for the first method where the contractor is to furnish the design; the contractor to make the shop drawings, that is, to put the engineer's designs into convenient shape for his workshop. Before commencing work in the shop, the shop drawings should be approved by the railway company's engineer.

The method still in vogue on a few railroads, to invite lump sum bids on steel structures accompanied by competitive designs, is not to be recommended. It is not in the interest of the railroad company and it is unfair to the honest contractor, as it puts a premium on the poorest design.

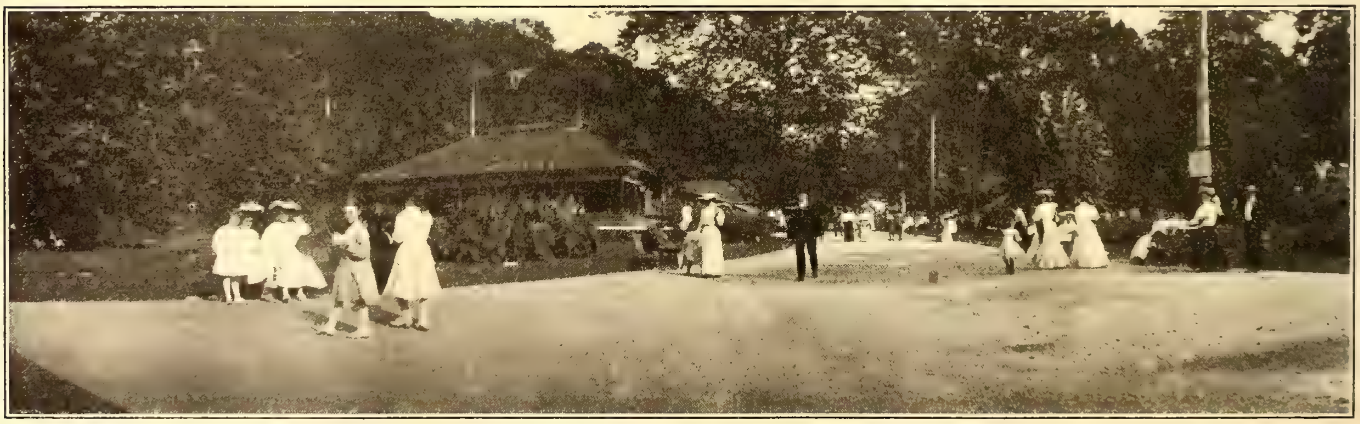
The standard practice to be recommended, as the only fair and business-like method, is to let contracts for structural steelwork on a pound price basis, on designs and specifications furnished by an experienced engineer employed by the railway company. This method is fair to the honest manufacturer, as all competitors bid on the same basis; it is an advantage to the railway company, as it employs the engineer who will protect its interests, study the conditions and requirements, and design a structure to suit the clients' needs.

ROCK SPRINGS PARK, CHESTER, W. VA.

Rock Springs Park is located in Chester, W. Va., across the Ohio River from the city of East Liverpool, Ohio. The park is most charmingly situated, commanding a magnificent view of the Ohio River, and constitutes the chief pleasure resort of Eastern Ohio. Although devoid of the clap-trap features found at New York's Coney Island, it bears about the same relation to the territory tributary to the Ohio Valley as does this famous resort to the surrounding country. Rock Springs Park is served not only by several steam lines but also by the line of the East Liverpool Traction & Light Company, thus making it unusually easy of access to the population for miles around. The steam railroads find it advantageous to feature this park in their advertising literature, with the result that each season they carry from 80,000 to 100,000 excursionists to the resort, and not infrequently a dozen special excursion trains will be operated to the park in a single day, many of these coming from distant Ohio, West Virginia and Pennsylvania points.

ENTRANCE TO ROCK SPRINGS PARK, CHESTER, W. VA.

The park line of the East Liverpool Traction & Light Company operates from the center of East Liverpool over its own steel suspension bridge, 1700 ft. long, crossing the Ohio River, and thence through the city of Chester, W. Va., to Rock Springs. On this line a frequent service is given, and it serves the double purpose of carrying the people from East Liverpool and neighboring points to the park as well as affording means whereby many of the steam railroad excursionists who visit the park can cross into Ohio and reach all points touched by the comprehensive system of the East Liverpool Traction & Light Company. A surprisingly large number of out-of-town patrons of the park take advantage of this ride, returning to Rock Springs Park in time to take the evening trains, this trolley ride being considered by many a



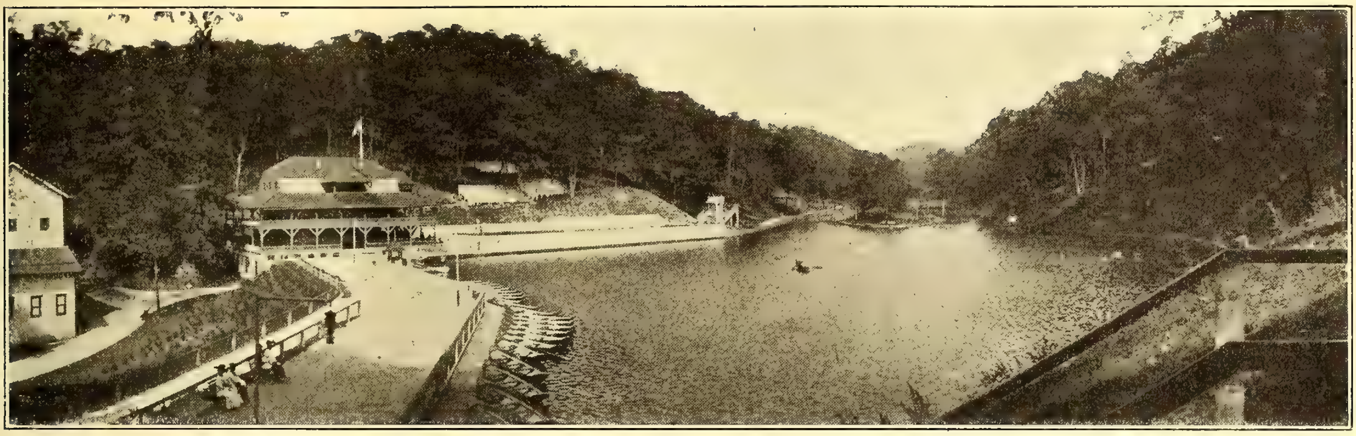
THE MAIN THOROUGHFARE OF ROCK SPRINGS PARK

special part of the day's outing in addition to the pleasures and attractions afforded by the park itself.

The natural and artificial attractions of Rock Springs Park have been handled with rare skill to obtain the best effects. The grounds cover forty-three acres of woodland, and include a ravine which has been partly cleared to give accommodations for picnic parties and strollers. Recognizing the drawing attractions of aquatic features, the management has at considerable expense dammed a small stream which runs through the grounds, thereby creating a lake that may well be described as a gem of its kind. This artificial lake covers about five acres and is not over 40 ins. deep, but it possesses all the scenic attractions of a natural body of water and gives the fullest opportunities for rowing without the slightest danger. The company maintains about thirty first-class rowboats and several naphtha launches for the use of patrons. The dam which holds back the water of the lake is about 175 ft. long, 21 ft. high, 8 ft. at the base, and is built of concrete and masonry.

SWIMMING TANK

A unique attraction, and perhaps the most popular at the resort, is a large swimming tank measuring 70 ft. long by 20 ft. wide and giving convenient accommodations for several hundred bathers. This swimming tank is built from ideas suggested by C. A. Smith, the present lessee of the park and its original promoter. The walls and floor of the swimming tank are formed of reinforced concrete. The excavation for the pool was first made by cutting away a portion of a hill. In the bottom of this excavation was laid 12 ins. of ashes directly on the earth. On this bed of ashes was placed a layer of concrete 14 ins. thick, with a 2-in. concrete dressing on top to give a smooth waterproof flooring. The side walls are 3 ft. thick at the base and taper to 18 ins. at the top. These walls are reinforced with steel cables 1 in. in diameter. One-half of the tank is designed to give a uniform depth of water of about 9 ft. In the other half the bottom is built on a slope, beginning at the water's edge and gradually sloping downward to give a depth of 8 ft. at the outer wall. This arrangement accommodates all classes of bathers. Children and young people can safely enjoy themselves in the shallow water, while the expert swimmers take advantage of the deeper sections to dive and swim to their hearts' content. At one end of the tank two wooden towers of different heights have been arranged with spring boards and platforms for those who enjoy diving. The tank when full holds about 600,000 gallons of water.



THE ROCK SPRINGS PARK SWIMMING POOL AND LAKE

The water supply comes from a clear running stream and is fed into the tank from perforated pipes which pass along one side of the tank and deliver the water in a series of spray effects. As the spring water is rather cold there is an auxiliary line of piping for supplying sufficient hot water to keep the temperature in the tank at about 70 deg. F. The water for this purpose is heated in two ten-gallon heaters which burn natural gas. There is also a 20-hp boiler which is utilized for heating water. A point is made of keeping the water absolutely fresh and clean, and at frequent intervals the entire contents of the pool are drained off, the bottom is scrubbed with wire brushes, and a fresh supply of water is allowed to flow into the tank. Along one side of the swimming pool are concrete steps and a concrete platform upon which the bathers may rest and enjoy sun baths.

DANCING PAVILION AND WALK IN ROCK SPRINGS PARK

A commodious building at one end of the pool gives accommodations for 120 dressing rooms, and the structure has wide verandas which are utilized for refreshment stands and for spectators who may care to watch the antics of the bathers. There is also a grand stand at the side of the pool which

gives seats for 800 spectators. In the basement of the bathing pavilion, under the dressing rooms, is an apartment containing the hot water apparatus and which is utilized as a laundry for cleaning and drying the bathing suits. In this connection, the management believes that the secret of successfully maintaining a swimming tank lies in the care used in keeping everything absolutely clean and sanitary. All of the bathing suits and towels, as soon as they have been used once, are put in a laundry machine in which they are washed and sterilized. They are then thoroughly dried in a centrifugal drying machine. The popularity of the bathing facilities at the park is due in very large measure to this care in washing and drying the suits and towels as well as to the attention that is paid in keeping the water in the tank in good condition. The degree to which the swimming tank is patronized will be understood from the fact that last season, constituting about one hundred days, over 25,000 people paid to bathe in the tank. The practice is to charge 25 cents for each person, which includes suit, towel, and the use of the pool and dressing rooms. On busy days each bather is limited to one hour in the pool. The pool is well lighted at night, and the bathing at night is almost as popular as in the daytime.

SWIMMING TANK AT ROCK SPRINGS PARK

CONCRETE PLATFORM AND DIVING TOWERS, SWIMMING TANK, ROCK SPRINGS PARK

OTHER ATTRACTIONS

Entrance to Rock Springs Park is through an artistic gateway which opens directly on to the main walk. The first building is the aquarama, or old mill, at the side of which is a check room where packages, lunch baskets and wraps are cared for. Opposite the check room on the right of the main wall are located the public dining room and kitchen for the use of excursionists and picnic parties. Here are seats and tables, and hot and cold water for making tea and coffee are supplied free. Another public dining room has lately been added to accommodate those who cannot find room elsewhere. In addition to these dining rooms for the use of basket parties, there is a well-equipped restaurant where meals are served for the convenience of those who do not care to carry their own lunches.

Following up the main walk the visitor comes to the theater, which has a seating capacity for 1400 people. Here high-class vaudeville entertainments are given every afternoon and evening.

Near the theater are the lake and swimming pool. The grounds around the lake have been left in their natural state except that walks have been laid out, trees trimmed, and the grounds improved to make the hillside attractive and easy of access without destroying the natural scenery. In the midst of this wooded landscape has been erected the band stand where free band concerts are given by celebrated musical organizations. The ground near the crest of the hill has been given over to the best of the usual park attractions, including merry-go-round, mysterious house, penny arcade, roller coaster, photograph gallery, shoot the chutes, pantograph or moving pictures, cafe, souvenir stand, rest houses, baseball grounds and casino. This last-named building has lately been constructed at a cost of $30,000. The ground floor is occupied with Japanese tea house, shooting gallery, bowling alleys and refreshment booths. The second floor is devoted to dancing and is 120 ft. x 150 ft. This building commands a wide outlook over the Ohio Valley.

In improving the park grounds the management has taken care to provide good drainage by installing an elaborate system of storm sewers and drain pipes.

The grounds and a portion of the buildings are owned by the East Liverpool Traction & Light Company, which has lately been purchased by the Ohio Valley Finance Company. The park is leased to C. A. Smith for a term of years, and is managed by J. H. Maxwell, acting for the lessee.

F. D. Norveil, assistant passenger agent, has just put into effect the new baggage rules promulgated by the traffic department of the Schoepf syndicate lines. These rules provide for the free handling of baggage by all the so-called merger lines in the two States. The lines adopting the new rules embrace all the Indiana Union Traction, Indianapolis & Northwestern, Indianapolis & Eastern, Indianapolis & Martinsville, Richmond Street & Interurban, Muncie, Hartford, & Ft. Wayne, and Indianapolis Coal Traction, the Columbus, Newark & Zanesville, Urbana, Bellefontaine & Northern, Columbus, Buckeye Lake & Newark; Columbus, London & Springfield; Dayton, Springfield & Urbana; Cincinnati Northern, Lima & Toledo, Cincinnati Interurban, and the Columbus & Lake Michigan Railroad.

SOME EUROPEAN BRAKES AND THEIR VALUE

BY JOHN P. FOX

A recent editorial in the STREET RAILWAY JOURNAL referred to several fatal accidents in England from runaway electric cars which were all caused by skidding wheels descending grades. In this country we are perhaps too ready to pass by troubles from slippery rails, and to accept skidding wheels, with their collisions and runaways, as unavoidable. But if different methods of braking can materially reduce damages, it seems well to look into the matter carefully.

American braking to-day is usually on a clean-rail basis, and for this purpose the air brake has reached a high degree of development and is being constantly improved. There is no trouble at fairly high speeds and where the rails throughout are practically never dirty or slippery. The difficulty comes on street tracks, and as we do not clean our rail surfaces, we have to depend on sand for bad rails. Then, if the sand box does not work, or the motorman loses his head, there is little to do but to wait till the car chooses to stop. A few railways, it is true, are using magnetic, track or emergency brakes, but the wheel brake is the main reliance, and the present tendency is simply to make them more powerful. In England, on the other hand, such serious accidents have resulted with wheel brakes that it has been found necessary to put less and less work on the brake shoes, and on an increasing number of cars there is almost none at all. It sounds strange to hear engineering authorities speak of hand brakes as too powerful and air brakes as positively dangerous; but English rail conditions are so often like those of Pittsburg that wheels can be easily skidded with a hand brake, even with four tons weight on a wheel, so that air would obviously increase the risks instead of diminishing them. Of course, skidding wheels are often due to poor motormen, and sand-box failures to neglect; but English standards are certainly very high in such matters, as illustrated by the practice of rail cleaning, and the uncertainty of wheel brakes cannot be lightly explained away.

The growing dissatisfaction with ordinary braking methods in England has brought about such improvements that one can now find thousands of brakes on cars to-day apparently more powerful and more certain on bad rails than any air brakes in this country, the latest type giving, in the recent London tests, an emergency retardation of nearly 7 m. p. h. per second on a greasy rail without sand. These London tests were so important that it is worth while to look at some of the results. Very careful experiments were made last year for the purpose of finding an economical brake that would safely allow a higher speed limit. The types tested were hand, rheostatic (short circuit with resistances), momentum, magnetic track brake independent of wheels (type A), and magnetic track brake operating brake shoes (type B). Most of the work was done with a double-deck car weighing about 14½ tons, with maximum traction trucks, fitted with carefully tested instruments. Both service and emergency stops were made on dry and greasy rails without sand. Coasting tests were also conducted on a hill with different brake notches. The current generated by the motors was measured so as to find the extra work required by electric braking. The emergency stops are the most interesting, and are shown in Tables I. and II.

The performance of type B is the most remarkable thing in these tables, and it will be noted that on a greasy rail this brake gave even better results than on a dry rail. This apparent anomaly was attributed to a more skilful application of type B as the tests proceeded. The superiority of type B over other types was very important in one respect for London, because the majority of accidents with electric cars there have occurred at the lower speeds. Table III. gives a further analysis of the results, and it may be stated that the figures are the average of three stops for each speed. Moreover, no attempt was made to get ideal conditions, so that the results represent every-day working conditions and the figures are absolutely impartial. Sand was not used with greasy rails because it would have destroyed uniformity of conditions.

TABLE I.
EMERGENCY STOPS ON DRY RAIL.

Initial Speed in Miles Per Hour.	Stopping Distances in Feet.				
	Rheostatic.	Type A Magnetic Track.	Type B Magnetic Track and Wheel.	Momentum.	Hand.
1	..	..	..	..	1
2	1	2	..	1	2
3	5	4	2	2	4½
4	9	6	3	3½	7½
5	14	9	4	6	11½
6	20	12	6	9	16
7	26	15½	8	13	22
8	34	19½	10	17½	29
9	44	24	12	23	37
10	58	28	15½	29	46
11	74	33	19½	35½	56
12	90	38	24½	42	68
13	107	43½	31	50	81
14	122	49	40	57	96
15	...	..	52	67	111

TABLE II.
EMERGENCY STOPS ON GREASY RAIL.

Initial Speed in Miles Per Hour.	Stopping Distances in Feet.				
	Rheostatic.	Type A.	Type B.	Momentum.	Hand.
2	4	6½	1½	5	3
3	10	8	2½	8	8
4	19	11½	3½	12	15
5	30	16	4½	17	22½
7	52	26½	7	27½	38
9	75	37	10	41	53
11	102	48	13	57	68
13	135	63	18½	76	88
14½	175	80	30	90	120

TABLE III.
NEW TYPE B.—EMERGENCY STOPS ON GREASY RAILS.

Initial Speed in Miles Per Hour.	Stopping Distance in Feet.	Retardation in Miles Per Hour Per Sec	Retarding Force: Percentage of Car Weight.
2	1½	1.95	9
3	2½	2.64	12
4	3½	3.35	15
5	4½	4.08	19
7	7	5.14	23
9	10	5.94	27
11	13	6.82	31
13	18½	6.71	31
14½	30	5.14	23

The power of type B can be judged by further comparisons with the best results from the other brakes and on other railways, as given in Table IV.

TABLE IV.
MAXIMUM BRAKING RESULTS.

Test.	Brake.	Date.	Initial Speed in Miles Per Hour.	Stopping Distance in Feet.	Retardation in Miles Per Hour Per Sec.	Retarding Force: Percentage of Car Weight.
Zossen, Germany	Hand brake	1901	62	2,362	1.48	7
" "	Air brake	1903	112	4,500	2.09	9½
" "	Air brake	1901	73	1,805	2.19	10
" "	Air brake	1902	*10?	...	3.49	16½
Atsion tests, N. J	High speed brake	1903	51	613	3.12	14
North Eastern Railway, England	High speed brake	1901	56	855	3.29	15
Westinghouse-Galton tests, England	Air brake	1878	60	567	5.20	21
Dundee, Scotland	Pneumatic track brake.	1902	8	12	3.90	18½
London, England	Hand brake	1905	6	16	1.65	7½
" "	Rheostatic brake	1905	2	1	2.92	13
" "	New type A	1905	14	49	2.93	13
" "	Momentum brake	1905	4	3½	3.35	15
" "	New type B	1905	11	13	6.82	31

* Retardation occurring at end of long stop.

The superiority of type B is obviously due to the fact that the braking takes place not only on the wheels, but also on the track and the motors; but even then the results are surprising, considering the fact that with the maximum traction trucks only half the wheels were braked.

As to the effect on the motors of electric braking, the tests brought out most important facts. While electric braking is very common in Europe, the motors there are not worked so hard and are better maintained as a rule than in this country. But even in Europe, overheating and additional repairs have made electric braking unsatisfactory on some roads, and have also resulted in complaints of slow operation, uncertainty of action, and roughness of stops. The magnetic track brake, which is very popular in England, seems more satisfactory than the Continental electric brakes, especially in its greater power; but even then, the common type can cause undesirable overheating of the motors. Recently, however, the magnets have been made larger, less current passes through the shoes, although the magnets are much more powerful, and the overheating difficulty, judging from the London tests, can be wholly ignored in the future. This puts electric braking in a new light for this country. For while in England larger motors were not installed for magnetic brakes, in this country they are evidently necessary where conditions are at all severe, and this tends to make electric brakes cost more than air brakes.

Table V. gives the ampere-seconds with different types of brakes as found in the London tests, and illustrates still further the superiority of type B in its latest form.

TABLE V.
SERVICE STOPS ON DRY RAIL.

Initial Speed in Miles Per Hour.	Ampere-seconds.			
	Type A.	Type B.		Rheostatic.
		Common Design.	Latest Design.	
2	30	9	10	70
3	55	27	15	110
4	80	53	20	152
5	105	84	27	193
7	160	160	38	275
9	210	203	50	360
11	260	263	73	445
13	300	322	118	530
14½	330	367	168	595

On a greasy rail, type B shows up still better, as shown in Table VI.:

TABLE VI.
SERVICE STOPS ON GREASY RAIL.

Initial Speed in Miles Per Hour.	Ampere-seconds.		
	Type A.	Type B.	Rheostatic.
2	30	7	125
3	39	10	185
4	50	14	242
5	75	16	300
7	132	25	415
9	207	30	532
11	297	38	647
13	385	45	765
14½	455	50	850

The current in emergency stops is about the same as in service stops. See Table VII.

TYPES OF MAGNETIC BRAKES TESTED

Two types of A brakes as well as of B brakes were tested, the latest design of A having larger magnets and is more powerful than the first form; the ampere seconds, however, were about the same in the old and new designs. Only the results with the new design have been given. The heating effects of the latest types of A and B were calculated from

TABLE VII.
EMERGENCY STOPS ON GREASY RAIL.

Initial Speed in Miles Per Hour.	Ampere-seconds.		
	Type A.	Type B.	Rheostatic.
2	30	7	200
3	44	12	255
4	62	16	310
5	83	20	360
7	143	30	470
9	215	40	575
11	292	50	682
13	377	58	790
14½	440	65	870

the London tests, and were found to add to the ordinary motor heating about 8 per cent for type A, and 1¼ to 1½ per cent for type B, but as much as 25 per cent for the rheostatic brake. In regard to type B, one estimate tended to show that in braking practically no work was thrown on the gears and pinions, the current generated by the motors during a stop being almost identical with the kinetic energy of the revolving armatures. On the other hand, with type A, in which the magnetic track shoes have no brake shoes to assist them, about 60 per cent of the work of stopping must be done by retarding the armatures. With type B, the brake shoes in the tests apparently did about 54 per cent of the work, the track shoes 35 per cent, and miscellaneous friction, etc., the rest.

Evidently, then, the latest design of type B, even for American work, would not require larger motors than otherwise used. Though at first sight the connections for setting the wheel brakes from the track shoes appear complicated, the maintenance cost appears to have been very satisfactory in England. Of course, such powerful brakes must be carefully operated, and the controllers should have sufficient braking notches, independent of the power connections, to allow easy retardation.

RECENT ENGLISH ACCIDENTS FROM RUNAWAY CARS AND THEIR LESSONS

Satisfactory as the magnetic track brake appears in the light of the tests, two serious runaways with cars equipped with them occurred recently in England. In both cases the wheels were skidded with the hand brakes, and the magnetic brake was not actually in operation. The first of these accidents can be briefly dismissed because the car appears to have gone out for work in an improper condition. All brakes need some adjustment, and if cars are put upon the road without proper inspection and repairs, accidents must be expected, even with the best of equipment.

The Highgate accident in London is more important. When the inexperienced motorman of a car tried to make a compulsory stop with hand brakes at the top of a long but easy hill, his wheels skidded. According to his story, he did all of the following things: signalled to the conductor to apply the rear hand brake, which was done without effect; released the hand brake and applied sand, but the wheels would not revolve; tried the magnetic brake then, though knew it would not work with the motors stationary; reversed the current twice to unlock the wheels, but merely opened the circuit breaker. The car was found with the controller handle on the last braking notch, but with the power reversed, which would prevent either braking or reversing. While the actual facts are somewhat obscure, it looks as though the disaster was primarily due to the locking of the wheels by the motorman, possibly made tighter by the conductor. English runaway cars are almost always due to this skidding of wheels by the hand brake, making the electric brake or reversing ineffective. It hardly seems safe to count on a motorman's releasing his wheel brake and applying

again more skilfully. That takes too much courage and self-possession for some men on a runaway car, and it is easy in such an emergency not to release entirely. Sand will sometimes fail at the critical moment, and it appears as though complete safety lies only in absolutely preventing the possibility of skidding the wheels, and in braking on track and wheels together. Type A does this last, but retards the wheels through the motors, which counts against it as a service brake. Type B puts little or no strain or heating on the motors, and appears to allow an adjustment of the wheel attachment so that skidding can never occur. But some powerful hand brake is obviously necessary on every car, in case the electrical equipment fails, and to hold a car for any length of time. With type B, the hand mechanism should work directly on the track shoes only, as has been done on some cars in this country. The shoes should be pressed down so as to allow them to drag as if operated magnetically, and thus apply the wheel brakes. With type A only the track shoes can be applied by hand.

The hand attachment to the track shoes overcomes two objections to the magnetic brake: First, by allowing the brake to be applied when passing over any manganese special work, though of course no braking is desirable on special work except in an emergency. Second, by allowing braking if a car is derailed; and it might be a good practice, after throwing the controller handle into the emergency position, to apply the hand attachment quickly, so as to have the brakes hold in case of derailment or any electrical failure. A third advantage is the possibility of allowing track cleaning, somewhat after the method used in England with mechanical track brakes. It is a common custom on some English systems always to screw down the wooden track shoe at the top of a steep grade and leave it on all the way down, thus keeping the rails clean, while in this country we are apt to think slippery rails are unavoidable. One of the leading English managers has said that he finds from experience that a greasy rail cannot exist on steep grades where the track brake is in constant use, as the rail is kept free. from slime and dirt by the constant action of the wooden track shoes. Perhaps it would be possible to mount on the end of the magnetic track shoe some spring cleaning block or scraper which would bear on the rails just before the magnetic shoe did. Then, when it was desired to clean the rails of dirt or snow or ice, either when descending a grade or even at other times, the hand brake could be lightly applied until the cleaning attachment was effective, while the magnetic attachment could be used just the same, leaving the cleaner always undisturbed at work. This would be a great improvement over the still too common method of trying to overcome slippery rails by the use of sand, either in a continuous stream or in intermittent heaps from sand boxes or scoops, to the detriment of track, motors, and wheels. If we had to be as economical of current as most European roads, we should clean our rails more, and not try to neutralize dirt by adding more dirt. The successful use of running water to clean tramway rails on ascending English gradients, and as an improvement over sand for railroad tunnels, might profitably be looked into by some American managers. If sanding were as reliable and as sparingly practiced as on steam roads, there would be little room for criticism. With skidding wheels, the friction has been found to be less than a third of that with the wheels revolving, and although on greasy rails sand has been found to give an adhesion equal to dry rails, its disadvantages have been realized for some time. Fortunately the magnetic brake makes its use unnecessary. And if this brake can be further used to remove existing dirt, it would be better still.

One obvious lesson of the Highgate accident was the need of preventing motormen from doing the wrong thing at the wrong time, especially from having too many possibilities. It may be said in defense of the European custom of having two or more independent brakes on a car, that the results in case of an accident can be no worse than with the American custom of having only wheel brakes. After the wheels are skidding hopelessly, the damage will be the same, and if the foreign motorman does lose his head, and fails to use the additional protective devices, he cannot make things worse, while if he keeps his head he may succeed in stopping his car. It has been suggested since the Highgate accident that motormen should be actually trained in stopping runaway cars on some safe grade. In this way nervous or unreliable men can be detected, and at least kept off dangerous routes. Another lesson is, of course, the danger of too powerful wheel brakes with uncertain rails, and especially with inexperienced men. The fatal car had a magnetic brake which, if used according to rule after the start had been made down the hill, would undoubtedly have stopped the car. But the preliminary stop was attempted with the hand brake. There should have been no choice. There is obviously a great advantage in having the emergency brake the same as the service brake, with simply an emergency position as with air practice. There is often no time to think, as in the Salisbury accident in England, where the brake handle was found in the running position on the locomotive, which accounts partly for the terrible destruction to the rolling stock. Evidently the thing was all over before the engineer could do even the most mechanical thing.

COMPARISON OF BRAKING EFFECTS

It may be well to compare the magnetic track brake further with other brakes, and first with air. If it is too powerful and liable to make too quick service stops, the same trouble occurs with air. Air braking on some city cars is very disagreeable because so jerky. The writer has found one motorman, trying to coast slowly down grade, apply and release about fourteen times a minute, being unable to make a single reduction that would keep the desired speed. The resulting motion of the car can easily be imagined. Of course all air brakes require more or less additional power, though little with axle driven compressors; while the magnetic brakes require none. With air brakes there is little chance of a motorman's running with brakes half on, as is so common with the hand equipment, but this practice is absolutely impossible with magnetic brakes, because the same handle is used for both power and braking. This leaves the right hand free for other things, like track cleaning, scrapers, etc. Again, in starting on a hill, there is no possibility of applying current before the magnetic brakes are released. This is very common on some air equipped lines, with jerks that are exceedingly disagreeable, to say the least. The fact, however, that air brakes are working so well on American electric cars makes it difficult to tell just where the limitations lie, just where to use them, and where not. Skidding wheels may not cause any accidents for a long time, and then, as has happened, three air-braked cars may collide in succession on a slippery grade. The general rule has been to install air on all occasions, except on the few Western roads referred to where its limitations were realized. But now, just as all brakes are adjusted to the weight of the car, should not the type selected be the one adapted to the worst possible rail conditions? and the worst possible employee, one might add? American manufacturers have rightly hesitated to install electric brakes in the past. But now that such remarkable improvements have been made in their foreign equip-

ments, it is to be hoped that they will soon be available for reducing accidents in this country.

COMPARISON OF DIFFERENT TYPES OF TRACK BRAKES

Type A came through the London tests well, though not so well as type B; but the heating effects were regarded as negligible, and the lower cost and the simplicity from lack of any wheel connections were in its favor. It also eliminated all brake-shoe wear. Its weak point is the hand attachment, which, to avoid skidding, must be applied to the track shoes alone. This attachment might not hold the car in an emergency, especially as the shoes are metal instead of the more effective wood. Again, since the Highgate accident, it has been urged that magnetic track shoes should be wholly independent of the wheels, as in type A, and that only in this way could all skidding be prevented. But the wheels do not skid with type B, while it is well known that too strenuous braking even with the motors alone will stop the wheels entirely for a moment, and then cause them to slip slowly, with perhaps the same loss of friction as if skidding.

The ordinary English mechanical track brake, with wooden shoes and no electrical attachment, has strong advocates, and, as already stated, has given admirable results in rail cleaning on down grades. But it is at its worst on a wet rail, and once when the wheels skidded on a greasy 10 per cent grade in Chatham, the track brake was ineffective in preventing a fatal runaway. It needs the co-operation of a wheel brake, and then is like the magnetic brake, except that the harder the mechanical track shoes are pressed down, the more the weight is taken off the wheels which is a disadvantage, though the high friction of wood tends to make up for this. Still, in its pneumatic form the mechanical track brake is very attractive, and its operation is independent of the kind of steel rail, in spite of derailment, and without regard to electrical failure. An effective combination for dry rail braking would be the following: Air brake operated by the motorman's right hand, controller handle and track brake by the left hand. To make an emergency stop, the power would be shut off, and a brake handle thrown with each hand. But careful adjustment would be needed to prevent skidding in an emergency, and on a bad rail even the combination would probably fall far short of magnetic braking, though it might answer every need for interurban service, and be added to present air-brake equipments without other changes. The pneumatic track brake would seem to allow the possibility of rail cleaning on a level or up grade, by a very slight application of the shoes fitted with some spring cleaner.

An important form of the track brake is that designed by Mr. Wilkinson, the Huddersfield manager, in which each track shoe is pressed down by two powerful adjustable spiral springs, and can be let down on the rail either suddenly, by pressing on a foot pedal on the platform, or gradually, by turning a hand wheel which slowly releases the levers normally holding the shoes off the track. This allows an emergency application impossible with the ordinary track brakes which are screwed down by hand. But hand levers as found in San Francisco and England also allow a quick and powerful application.

Some think the magnetic track brake has another point of inferiority to the other track brakes, in that the shoes are metal instead of wood, causing less friction and more wear on the rail. But the friction between the metal and the steel rails certainly seems enough, and the London manager believes the wear on the rails is no greater with an iron shoe than with wood permeated with sandy grit.

OTHER EMERGENCY BRAKES

Special emergency brakes are not satisfactory if they depend on the revolutions of the wheels to set them, unless there is no possible way to skid the wheels, which seems never the case. And again, they may be forgotten at the critical time. In one English accident, the car had an emergency brake specially for keeping it from running backwards in climbing a hill, but also very powerful as an emergency track brake if slid under the front wheels. The runaway began as usual because the hand brake was too powerful for the state of the rails, and the sander failed, though apparently all right. The rheostatic brake was applied twice, without effect, of course, as the armatures were not revolving. Then the motorman released his hand brake and shouted to the conductor to apply, forgetting that with his wheels at last free either his rheostatic or emergency brake would have acted. Reversing had no effect, as the trolley came off. An American car would have come to grief in the same way under the circumstances, as the three ways of stopping would have failed. The English car had five ways, and so more chances; but skidding was possible, and the motorman finished things.

Continental brake practice does not suggest as much as English, probably because conditions are not so severe. Some managers prefer air, others electric brakes,

MAGNETIC AND OTHER TRACK BRAKES FOR TRAIN OPERATION

As to simultaneous braking on trains of two or more cars, of course nothing has been attempted yet with track brakes. But it is not impossible. Many trailers on the Continent are equipped with disc or solenoid brakes operated by current from the motor car. The magnetic track brake appears to have enough reserve power to apportion a third or a half to a light trailer. Some of the recent trailers tried in this country have been too heavy. A similar mistake has recently been corrected in Berlin, and the latest semi-convertible trailers built there now weigh only 9700 lbs., with cross seats for twenty-four passengers, requiring to haul them only one-third of the current of a motor car, in place of a previous one-half. With American seat allowance, these cars would seat thirty-two passengers. In one city in this country, with similar speeds to Berlin, recent trailers weigh about 21,800 lbs., with only thirty-four seats, and required automatic air brakes. Operation is so careful in Berlin that automatic air brakes have been found unnecessary, even with three-car trains, including two double-deck trailers.

If magnetic track brakes are desired on cars hauling light trailers as in Berlin, and automatic brakes are wanted for safety if the cars part, the following arrangement might prove satisfactory: Magnetic brakes on the motor car ought easily to handle a five-ton trailer. The latter could be equipped with a spring track brake after Wilkinson's pattern, which could be set by hand, and have wheel brake added or not as desired. If the cars parted, an emergency chain fastened to the motor car could pull a trigger setting the trailer brakes automatically, and then the motor car would be free to pull ahead out of the way.

REGENERATIVE BRAKING

Although the magnetic track brake seems in most ways about the last word in braking, it has rivals in England with one great advantage. The magnetic brake can, if rightly used, stop a runaway car; but it cannot prevent the initial running away, as is done by the systems of regenerative control now being widely tried in England. It is unfortunate that our experimenters should have abandoned direct-current

regeneration, and allowed England to make it the working success it appears. Of course defects may still have to be remedied, but over a hundred cars are already in use on a dozen or fifteen lines, and a brief examination last summer made things appear very promising. On one line visited, regeneration was being tried, not so much to save current, as the city is comparatively level, as to save wear of wheels and brake shoes, the application of the latter being needed only when the car has nearly stopped. The braking down to this speed is done by simply bringing back the power handle notch by notch, each notch corresponding to a given speed up hill or down. This first part is even simpler than operating a magnetic brake, and quicker of application; for the shutting off of the power also does the braking. But whether the car actually responds as quickly as to a magnetic brake is a question. The retardation is certainly very smooth. For the final stopping, one system employs an automatic friction brake operated by a solenoid in connection with the controller, so that the brake is applied when regeneration ceases at about 1 m. p. h., and is released when current is applied for starting. This same brake is automatically applied in case the trolley comes off or the electric circuit is broken in any way; and so, if mechanically reliable, it might serve as an automatic brake for trailers. With the other regenerative system, if the trolley comes off, an automatic switch closes the circuit again through resistances, while if the electric circuit is out of order, an emergency notch on the controller introduces a special series winding, giving rheostatic braking as with ordinary motors. It is claimed that regenerative braking is easier on the motors than even magnetic braking, especially in the braking system where no resistances are used. But it is more or less of a disadvantage to have to use a second brake for the final stopping and holding of the car, except perhaps where the second brake is automatically applied and released. If this second brake applies both track shoes and brake shoes and the latter so as not to skid the wheels, it would be an advantage; but even then it could hardly hope to equal the magnetic brake for quickness of emergency stops.

For hilly routes, a system is certainly very attractive with which the speed of the car can never exceed that set for each controller notch, and in which descending cars can return to the line as much as 50 per cent of the current used in ascending the same grade, with an average saving said to range from 7½ per cent with a fairly level line to 30 per cent with a very hilly one. For a city like San Francisco, the system would seem an ideal substitute for the cable, as the cars would never exceed the maximum speed desired any more than if gripped to a cable, and the descending cars again, with their regeneration of power, would assist cars ascending grades. The latest regenerative motors have series parallel control. The motors in one system are compound wound. In the other the field coils are connected to serve as series windings during acceleration and as compound windings during regeneration. Fuller descriptions can be found in the English technical press.

After the Highgate accident, London "Engineering" strongly advocated regenerative control as the sure preventive of runaway cars; and for this purpose of keeping rigidly to desired speeds and always having a car under control, it may prove ideal, especially for hilly roads, even if slightly more complicated and expensive than former systems. But for level cities, where powerful emergency brakes are more needed than extreme economy of current, magnetic brakes at present seem preferable, unless it is feasible to combine the two, reserving the magnetic brakes perhaps for emergency applications.

AUTOMATIC SLOW-DOWNS POSSIBLE

With the Salisbury accident fresh in mind, and that at Providence where a motorman came on a sharp curve unawares at full speed, it may not be long before there is a demand for some method of slowing cars and trains down to safe speeds automatically at dangerous points. Automatic control is not considered too complicated for hoisting and conveying machinery, and its further extension to electric railways might sometimes pay well for the cost. The track stop in its present form is hardly suitable for frequent slow-downs. The latter may be better effected by varying heights of the third rail, after the idea on the Berlin Elevated and Underground Railway, where it will be remembered the contact shoe is dead at its lowest point, closes a power switch at its second level, and cuts in the car lights in the subway at its highest point, all automatically. The same controlling circuit might be operated by varying the heights of the trolley wire, and, in connection with regenerative control, this might afford perfect protection against too high speeds at the wrong place. The steady reduction of the human element is certainly more interesting than cleaning up wrecks, settling claims, and trying to explain to the public how avoidable things could not be avoided.

REGENERATIVE BRAKING FOR SUBWAYS

There may be urgent need of the use of regenerative control if subways are to be used indefinitely. Take the question first of iron dust from braking. This has caused concern in European subways from collecting on insulators and as being dangerous from its inflammability. But it has assumed most serious proportions in the New York subway, where the air is saturated with the shining metal particles, and where alone they amount in quantity to as much as the average weight of dust in the winter street air of New York. If this excessive amount of metal dust should prove to be injurious to those who have to work constantly in it, if not to the passengers' lungs and eyes, regenerative control would seem to offer the type of braking with least wear of metal. But it also affords a means of reducing current consumption and so of heat production. While subway heat has not been proved injurious to health, it does deter people from riding, and is one of the causes limiting the extent of subway travel in Europe. The traffic on one comparatively new European subway is already slowly falling off, although its average temperature last summer was over 10 degs. cooler than the New York subway. This European railway runs seven-car trains on a two-minute headway; but, although the average current consumption, with a speed of 14 m. p. h. including stops, is only about 37 watt-hours per U. S. ton-mile from careful tests, the subway temperature had risen last summer to over 20 degs. above the temperature of the line when first operated. If the temperature in the New York subway reached 98 degs. last summer with a production of only 56 per cent of the proposed heat and power, what will the future bring?

The immediate need in New York is, of course, a great reduction in current consumption without reducing, if possible, the present average speed. This may seem impossible at first, as it means the building of new side-door cars, at apparently prohibitive expense, to shorten the stops; and besides, side-door cars have been considered out of the question because of curved platforms. American and European improvements, however, have made possible the use of side doors at any subway station in New York, even at the City Hall with its 150-ft. radius curve. The present car dimensions would allow 100 seats to a car instead of the present 52, with comfortable standing room for 80 more, and ten doors on each side. The shortening of stops possible with such

cars, and the great reduction possible of the maximum speed, etc., make it appear clear that the present rush-hour speed could be maintained with so much less current than now that the saving in cost of power would pay the fixed charges on the new rolling stock. It is not often that so new and costly an equipment can be replaced with actual profit, and it is fortunate that such is the financial inducement in this case, in view of the inadequate capacity of the present cars and entrances, of the danger of the wooden cars from further fires, and of the weakness of even the steel cars in case of derailment. The shortening of stops would seem to allow an increase in the number of trains, if desired, till the seating capacity of the subway reaches three times that at present, or, if eight-car locals are ever run, about four times the present limit.

Just how much saving in current regenerative braking by itself would effect in the New York subway seems uncertain yet, but further English experience may throw more light on the matter. Some authorities would put the percentage very high, but, even if low, the reduction of the iron dust might make it desirable, and in cutting down the heat supply every possible method may be necessary. In future subways, steeper grades and grades at all stations will be highly desirable. Such grades on the Central London supply about 25 per cent of the force needed for acceleration and 25 per cent of the force needed for braking. American acceleration has hitherto been too ambitious to take advantage of such means of assisting starts and stops. The effect of grades on braking is well illustrated in the Glasgow District Subway, where the air brakes are seldom used; a light application of the hand brake on the motor car suffices to stop the light trains. The profile of this line is so refined that, instead of having the stations level, the ascending gradient is continued to the center of the station platforms, and the descent begins at the same place, so as to assist braking till the last second, and acceleration as soon as a train starts.

POSSIBILITIES OF EMERGENCY BRAKING WITH TRACK BRAKES

While on railroads and interurban electric lines, with clean rails, air braking on the wheels can give rates of retardation about as high as comfortable, one cannot help thinking that many accidents might be at least lessened in severity if emergency stops could be as quickly made as with magnetic brakes. The low retardation results obtained at Zossen even under the best conditions, and the heating of the tires and other difficulties, suggest especially the possible value of high-speed experiments with magnetic and pneumatic track brakes. Wooden track shoes under the very worst conditions of wet street rails have been found to increase the retarding force about 20 per cent, and would therefore diminish the stopping distance 20 per cent. The effect of magnetic brakes on collisions can be seen from the following example: Suppose two 25-ton cars, running towards each other at 30 m. p. h. on the same track, fail to come in sight till 200 ft. apart, and then are braked at the rate of 3 m. p. h. per second. They will collide at a speed of 22 m. p. h. with a force of 410 tons each. If they have magnetic brakes that can retard at 6 m. p. h. per second, they will collide at a speed of only 9 m. p. h., with a force of 68 tons each, or one-sixth of the former amount. The maximum retardation found for magnetic brakes in the London tests would stop the cars 6 ft. apart without any collision at all.

Since the above was written, an English critic of the combined magnetic track and wheel brake has called attention to what he considers a danger of combining the two. While admitting the advantages under ordinary conditions, he is afraid that if the track shoe strikes a bad rail joint or a projecting paving stone the shoes would be crowded on the wheel so hard as to skid the wheels. The effect of such a blow would not be merely momentary, as the friction of the brake blocks on the rails would keep the extra pressure on. Wheels under this condition would remain locked after the hand brake had been taken off. The same critic, however, unintentionally suggests the remedy in advocating the use of an improved spiral spring of many turns in the hand-brake system to prevent skidding. This spring would be adjusted so as to give way when the force applied is a trifle less than enough to stop the wheels on the worst rail. A similar spiral spring, similarly adjusted, can be inserted with the magnetic track brake somewhere between the cam worked by the track shoe and the wheel shoe, and would then appear to make skidding impossible under any conditions.

GAS ENGINES CONSIDERED BY THE NEW ENGLAND STREET RAILWAY CLUB

The September outing of the New England Street Railway Club was held on Thursday, the 6th inst., with about 150 members in attendance. The members assembled at 8:45 a. m. in the trainmen's schoolroom of the Boston Elevated Railway Company at the Sullivan Square Terminal, and first listened to an informal talk on gas engines by President Paul Winsor, chief engineer of motive power and rolling stock of the Boston Elevated. At the conclusion of the talk three special cars, furnished by the courtesy of the company, were boarded, and the party was taken to the Clarendon Hills power station of the company at West Somerville. Here the members inspected the new 1200-hp Power & Mining Company's gas engine plant, with Loomis-Pettibone producers and Crocker Wheeler generators. After a short stay the route was taken up to the new gas engine plant of the Boston Elevated at Salem Street, Medford, which consists of three 500-hp De La Vergne gas engines direct connected to 325-kw Crocker Wheeler generators, and a Camden Iron Works gas producer outfit. Both of these plants were described in the STREET RAILWAY JOURNAL of Nov. 4, 1905.

After inspecting the gas plant at Medford the party was taken to the works of the New England Gas and Coke Company in Everett by special cars of the Boston & Northern Street Railway. During the stay of the members at the gas and coke plant, a light luncheon was served by the New England company. The afternoon was spent in the pursuit of pleasure at Wonderland Park and Revere Beach, admission to the park having been given to the party by the management of Wonderland.

In discussing the gas engine problem informally, Mr. Winsor stated that for several years it has been his opinion that the gas engine is the coming prime mover. Few steam plants show a better efficiency than 3 lbs. of coal per kilowatt-hour, but the Boston Elevated's plant at Somerville has averaged less than 1.5 lbs. of coal per kilowatt-hour for all coal consumed in regular service runs since May 2, 1906. This great economy in fuel is obviously the chief advantage of the gas engine plant. The chief trouble has been the noisy exhaust, but this is being remedied gradually. The Somerville plant has been operated sixteen hours per day in commercial service, beginning at 7 a. m. and shutting down at 11 p. m. The plant has been shut down only when power was not wanted, or when slight adjustments had to be made, incidental in getting a new installation in running order. The Medford plant was not ready quite as early as the Somerville station, and only one engine has been operated so far, as

the company wished to reduce the noise as much as possible before inaugurating regular operation in the residential district where the station stands. It is expected that the station will become practically noiseless in due course. The fuel economy of the plant is the great point of value. It has been difficult as yet to obtain a correct idea of the labor cost of turning out power. It is at present rather high, but should compare favorably with a steam plant in the long run. Mr. Winsor then exhibited several drawings of the gas engine cycle, and discussed the features of the four-stroke cycle and also the cycle in which the engine does work in one stroke per revolution. Many engines are made with tandem coupled cylinders, corresponding in performance to a single cylinder steam engine. At the Medford plant gas and air pumps are mounted on the engine.

Discussing sources of fuel gas, Mr. Winsor emphasized the excellence of illuminating gas, but pointed out the objection of its high cost. As made by distilling coal heated in a closed retort, it has a thermal value of about 600 B. T. U. per cubic foot. Natural gas is admirable where it is available, and it has a calorific value of about 1000 B. T. U. per cubic foot. The cheapest gas is that of the blast furnace, but it has a thermal value of only about 80 or 90 B. T. U. per cubic foot, and is very dirty. Producer gas is made, generally speaking, by burning live coal in a closed chamber on top of a bed of ashes. Air is forced in beneath the bed or drawn in by a blower on the discharge side of the producer. The producer has a double top. The chemical reactions are relatively simple. The entering air burns the live coal to CO_2 as follows: $C + 2O = CO_2$. The CO_2 then passes through the upper part of the coal bed and is reduced to CO: $CO_2 + C = 2CO$; then the CO burns to CO_2 in the engine cylinder: $2CO + O_2 = 2CO_2$. The gases are passed through cooling and cleaning apparatus before being utilized in the engine.

In a soft-coal producer plant hydrogen and tarry matter are distilled at a fairly low temperature. The tar must not go into the engine, so it must be separated from the gas if soft coal forms the basis of operations. This process is called scrubbing, and it consists of passing the gas through a vertical tank in which are suspended horizontal trays of coke, over which water runs. The suction of gas can be run by the engine if desired; the suction stroke of the piston in such cases draws the gas through the producer and into the cylinders. The West Somerville plant is at present at something of a disadvantage in regard to ashes removal. The cleaning of the producer and removal of ashes has to be done when the plant is shut down, as the producers are installed in a unit pair. Both must be in operation at the same time.

This plant is equipped with a rotary blower which draws the gas from the producer to the engines. With soft coal the tar passes in this type of producer down through the hot coal and then passes off as a permanent gas. The company gets a large quantity of lamp black in the operation of its plant at West Somerville. It is separated by spreading it out and allowing it to dry. With this form of producer one can always see the fire. The drawback is the difficulty of cleaning. The fire is too hot for shaking grates and it makes a bad clinker unless cooled by a steam jet. There is no loss of heat in this way, for we get $H_2O + C = 2H + CO$, both of which are combustible gases. It is not possible to use a large amount of hydrogen in the engine cylinders. About 12 or 13 per cent of hydrogen is produced in this plant, and trouble occurs if this is much exceeded.

Few steam plants give an efficiency of 10 per cent from the coal. About double this can be obtained in a gas plant. In a producer plant about 25 per cent of the heat of the coal is lost, and about 30 per cent in a steam boiler installation. The principal losses in the gas plant are in the engine water jackets (25 per cent) and in the exhaust (30 per cent). The largest loss in the steam plant is the latent heat of the exhaust steam, as it is condensed.

The Somerville plant never requires over fifteen or twenty minutes for starting up. If it were shut down twenty-four hours it might take thirty minutes to commence operation. Thus far the principal troubles have been oil troubles. The quantity required was excessive, and the capacity of the filter was insufficient. This is being remedied, but on account of the large surface to be lubricated it is doubtful if the oil consumption becomes low. A good many premature explosions and miss fires have been noted, but the conditions are now improved. A rocker shaft was broken and a few mechanical difficulties were experienced, but more hours of work have so far been gotten from this gas plant than from a turbine installation which the company is inaugurating. Mr. Winsor closed by exhibiting some graphic examples of the energy loss in the different parts of a steam and a gas plant.

CORRESPONDENCE

HAND AND POWER BRAKES

New York, Sept. 10, 1906.

Editors STREET RAILWAY JOURNAL:

Some one has said that ever since the first railroad train was started there has been a constant effort to stop it. It was many years after the railroads were firmly established as a commercial necessity of the world before power brakes or brakes under the control of the engine man were accepted for general service, and it took twenty-five years more to put them upon freight cars. Electric roads have worked more quickly. They have condensed the experience and the advance of a decade on the part of the steam road into a year, and twenty years has seen the advance from the light 16-ft. car with a motor on the platform to the present heavy equipment of city and interurban lines.

With the increase of weight has come the increased necessity for efficient and quick-acting brakes. As far as efficiency is concerned the old-fashioned, slowly-applied hand brake does its work as well as any other after the brake-shoe pressure has once been brought against the wheels. The drawback consists in the time required to make the application. It is evident, of course, that the effectiveness of a brake-shoe does not depend upon the source of the pressure with which it is applied, but upon the actual pressure so secured. And it is also evident that the leverages can be so arranged that a pull upon the hand brake can be made to put the shoes against the wheels with as great a pressure as any air or electric brake. The difference between the two depends upon the time required to obtain the maximum pressure. With the hand brake so adjusted that the shoes are brought against the wheels with one and a half turns of the handle, the time required will range from 1½ seconds to 2½ seconds, dependent upon the man, the length of time he has been on duty, and the condition of the rigging. With the air brake this is cut down from ½ second to ¾ second, while with the electric and some forms of power brake it is again cut to from 3-16 second to 5-16 second. With a car running at a speed of 10 m. p. h., or 14 2-3 ft. per second, this means that the electric or air brakes can stop a car before the hand brake can be applied. In other words, the human effort is largely eliminated.

Incidentally it may be remarked that the condition of the brake rigging has a very important influence not only upon

the speed of application of hand brakes, but the actual shoe pressure obtained. In brake tests carried out some time ago, where arrangements had been made to obtain a continuous pull on the brake chain of 450 lbs., it was noticed that the apparent effort of the man at the handle was much greater at some times than it was at others. This led to an investigation of the fractional resistances of the brake staff. It was a staff of the ordinary sort held by straps to the front dasher and by a strap at the bottom. A dynamometer put on the handle and another on the brake chain showed that, to obtain a pull of 450 lbs. on the latter, required a pull at the handle ranging from 30 lbs. to 50 lbs., while, after this brake-chain pull had been obtained, it could be maintained by one at the handle of from 25 lbs. to 45 lbs. In other words, more than 50 per cent of the energy of the man was apt to be expended in the mere turning of the brake staff and overcoming the frictional resistance in its bearings and supports without any return in useful work in the way of pressure at the shoe.

Another source of wastefulness on the part of the hand brake is its demand for close adjustment in order that the time required to make an application may be kept down to the lowest limit. For this reason roads that are using hand brakes have, or should have, the shoes adjusted daily and brought up so that there is not more than ⅛ inch clearance from the wheel. With this the motorman is apt to keep the shoes dragging at all times, thus putting a direct draft upon the coal pile, increasing the rate of wear of the shoe and wheel and thus adding a very appreciable though uncalculable amount to the cost of operation.

It would seem, then, that for street railway service the speed of application and the prevention of accidents that might be expected to result would be quite sufficient to warrant the use of air or electric brakes. As a matter of fact this supposition will not hold because of the personal equation of motormen and the public. An inquiry made among a large number of claim agents brought out the fact that the introduction of air brakes had produced no appreciable falling off in collisions and other street accidents and in the resultant claims for damages. The reason is that, as soon as the motorman finds that he can stop in a third of the distance that he could with the hand brake, he only allows himself that one-third distance, and the public, both afoot and in vehicles, soon learn the same fact and take their risks accordingly, so that the claim department still continues to work full time and there is no falling off in the street accident record. In spite of this undisputed condition of affairs the railroad company for whom the inquiry was made very shortly thereafter proceeded to equip its cars with air brakes because it was possible to run them at higher speeds at the same risk than it was with the old-fashioned hand-brake application. This meant the same service with fewer cars, or more frequent service with the same number of cars, together with more rapid transit.

These are general statements, while the efficiency of the brake depends upon a multiplicity of details that cannot be discussed at this time, such as the man, the brake rigging and apparatus in point of physical condition, the type of shoe used, its play and the like. But the summing up of the position may be embraced in the statement that the application of power brake-shoes does not decrease the number of accidents, although the fact that the company is using the best-known devices may lessen the jury awards for claims, although this in turn is doubtful. On the other hand, the air brake or its equivalent does permit the use of a faster schedule than the hand brake, due to a shorter time required to apply, while the latter does its work thoroughly and well when it is once on.

HENRY M. HUNTER.

MILAN EXHIBIT OF VIENNA MUNICIPAL TRAMWAYS

The Vienna municipality, which operates the local tramways, has installed an unusually elaborate exhibit at the Milan Exposition. The exhibit is designed to show in miniature the construction and operating features of a large railway system. The Viennese methods of collecting current both by the overhead and conduit systems are shown in connection with a piece of double track and switch. There are samples of various methods of suspending wires, installing insulators, pull-offs, etc. A typical waiting room has been built, containing the usual passenger accommodations, together with telephone and emergency apparatus for car accidents. As an example of its rolling stock the municipality shows a richly-furnished motor car for rental service. The car is finished in mahogany and gold, and several Viennese scenes are painted in water colors on the panels over the doors. Another rolling stock exhibit consists of a standard three-car train, consisting of one motor car and two trailers. One of these trailers has the entrance in the center between the two compartments. An especially interesting car is the one built for the Vienna-Baden branch. It has two trucks, each carrying two 300-volt, 15-cycle, single-phase Siemens-Schuckert motors which are wound also to use 500 volts d. c. on the city divisions. Another interesting exhibit is a motor-driven rotary snow plow, and the electric automobiles for accident relief work and minor repairs. A gasoline tower automobile for repairing overhead work is also shown, together with models of the shop tools employed.

OPENING OF THE RACINE DIVISION OF THE CHICAGO & MILWAUKEE ELECTRIC RAILROAD

The Racine extension of the Chicago & Milwaukee Electric Railroad was formally opened Sept. 1. The extension is 10 miles long, and is built on private right of way 100 ft. wide. Double tracks are now laid, but provision has been made in the construction of concrete arches and construction of stations for four tracks eventually. There are no grades on the line, and there are no curves of less radius than 45 minutes. The terminus in Racine is at the extreme west limits of the city. This construction and location was followed in view of the fact that the extension will eventually be a portion of the through line between Chicago and Milwaukee.

The opening of the Racine division was attended with much formality. Special cars on the Chicago & Northwestern Railroad carried invited guests of President A. C. Frost to Waukegan, where four special cars of the Chicago & Milwaukee Electric Railroad were in waiting to convey the guests to Racine. Here a banquet was held in Dania Hall. Mayor Nelson, of Racine, officiating, introduced the following speakers: Captain Anson, of Chicago; F. B. Jackson, of Evanston; Judge Pierce, of Highland; Mayor Jackson, of Lake Forest; Mr. Whitney, of Waukegan; A. C. Poss, of Milwaukee; Judge Barnes, of Zion City, and Senator A. C. Frear, of Wisconsin. All of the speakers were high in their praise of the constructed road and of President Frost.

President Frost, the host of the occasion, at the conclusion of the addresses in a modest manner expressed his appreciation of the many kind words uttered by the previous speakers. He added that in building his road he had built it only in accordance with what be believed the future of the territory traversed demanded. Referring to further extensions toward Milwaukee, he said that within a year he believed the road would be completed into that city.

At 6 o'clock the guests were taken over the line in special cars to Ravinia Park, where dinner was served.

TWENTY NEW CARS FOR HOUSTON ELECTRIC COMPANY

The twenty new cars built by the American Car Company for the Houston Electric Company (Stone & Webster, general managers) have the Brill grooveless post semi-convertible feature, as will be seen by reference to the low window sills, window system, maximum interior width and other features which have made this type of car very popular. The present consignment will make thirty double-truck cars delivered to the Houston Electric Company within a year, all the cars being mounted on No. 27-G1 trucks having solid forged side frames with a wheel base of 4 ft. 6 ins.; axle diameter, 4 ins.; wheel diameter, 33 ins. Cherry constitutes the inside finish of the cars of the present order, and the ceilings are of three-ply birch, decorated. The length of the seats is 35 ins. and the width of the aisle 26 ins.

The principal dimensions are: Length over the end panels, 28 ft., and over the crown pieces 38 ft.; width over the sills, 8 ft. 6 ins., and the same dimensions apply to the width over posts at belt; from center to center of the posts is 2 ft. 8 ins.; height from the floor to the ceiling, 8 ft. 5⅝ ins.; height from the track to the platform step, 16 15-16 ins.; the framing includes side sills of 4 ins. x 7¾ ins.; center sills, 3¾ ins. x 4½ ins., and end sills, 5¼ ins. x 6⅞ ins., while the outside sill plates measure ⅜ ins. x 12 ins.; corner posts are 3¾ ins.; side posts, 3¼ ins.

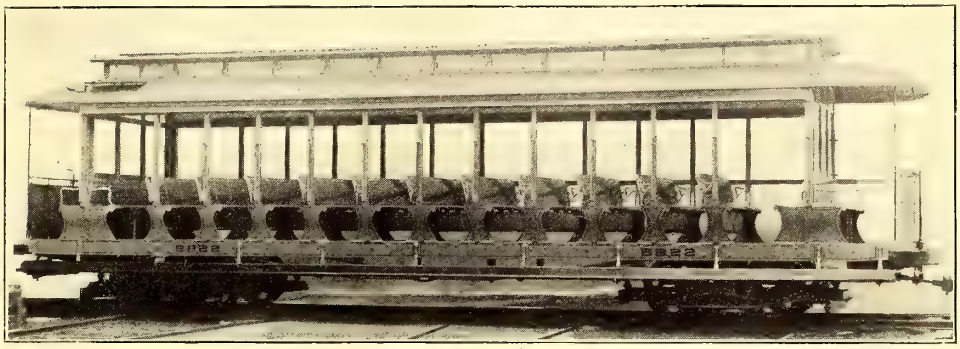
The Houston street railway system embraces fourteen routes, the length of trolley lines being 44 miles. Ten acres of land situated on the extension of the Franklin line were bought recently, on which has been erected a car house and shop building, the latter including an armature winding room,

COMPLETELY EQUIPPED CAR FOR THE HOUSTON ELECTRIC COMPANY

machine shop, blacksmith shop, paint and carpenter shop where repairs of all descriptions are made. The company is at present operating from this location, having erected temporary buildings while the permanent structures are in the course of construction. A short time ago, two miles of tracks were opened which belted together the Franklin and Congress lines, and this summer the company commenced to operate an extension which belted together the Montgomery line and the Houston Avenue line, a distance of about 2 miles. Inasmuch as this line serves Highland Park, which is owned by the street railway company, it is known as the Highland Park line. This summer has also seen an extension of the Louisiana line to the new suburb of Hyde Park, and in the early fall the Fairview addition to the City of Houston will be benefited by the extension of the South End line. Very extensive repairs to tracks and overhead lines have occupied the company's attention of late, and in the case of the latter, No. 00 trolley wire is being substituted for No. 0. The new cars will run over the following lines: South End, La Branch, Arkansas Pass and Louisiana.

OPEN CARS FOR ATLANTIC CITY

In the Street Railway Journal of Sept. 1 there appeared an article describing the rolling stock for the new West Jersey



ONE OF THE LATEST OPEN CARS FOR THE WEST JERSEY & SEA SHORE DIVISION OF THE PENNSYLVANIA RAILROAD

& Seashore division of the Pennsylvania Railroad, the cars being of the standard form of Pennsylvania Railroad day coaches and built by the J. G. Brill Company. No mention was made, however, of the fact that the same builders have lately delivered to this company six open cars for operation on the lines between the Inlet at Atlantic City and Longport, the cars being generally similar to other cars for summer service furnished heretofore by the same company. The new cars will seat seventy-five passengers, and in them will be found the usual features of Brill cars of this type. They measure 40 ft. 4⅜ ins. over the crown pieces, and the width over the sills is 7 ft. 9½ ins.; over the posts at the belt, 8 ft. 7½ ins.; sweep of posts, 5 ins.; distance from the center to the center of the posts is 2 ft. 6 ins.; side sills are 5½ ins. x 8 ins. and sill plates ⅝ ins. x 8 ins.; thickness of the corner posts, 3⅝ ins.; side posts, 2¾ ins. The cars are mounted on No. 27-G1 trucks having a wheel base of 4 ft.; axle diameter is 3¾ ins.; wheel diameter, 30 ins. There are four 40-hp motors on each car.

In addition to the several lots of open cars which this car builder has delivered to this road, it has also furnished on two occasions cars of the semi-convertible type which were particularly pleasing specimens of this type of construction, being finished in mahogany. In short, practically the entire equipment for the lines running along the ocean front in Atlantic City were furnished by the builder of the present consignment.

The Lima & Toledo Traction Company, of Lima, Ohio, opened the first section of its new Toledo line as far as Ottawa on Sept. 15. A two-hour service was inaugurated. Within a few weeks the service will be extended to Leipsic. Rapid progress is being made on the balance of the line, and it is expected that it will be completed to Toledo next year.

FINANCIAL INTELLIGENCE

WALL STREET, Sept. 12, 1906.

The Money Market

There has been a decided change for the better in the monetary situation during the past week. Following the announcement by the Secretary of the Treasury that he would facilitate the importation of gold from Europe by making advances to the importers pending the arrival of the gold at this side, caused a sharp relaxation in rates for both call and time accommodations. Call money, which at the close of last week loaned as high as 40 per cent, loaned as low as 2 per cent during the current week, while time contracts extending from ninety days to six months, declined to 7 per cent, which is about 1 per cent below the high rate attained last week. As was generally expected, the relief plan put into effect by Secretary Shaw on last Monday was followed by extremely heavy engagements of gold in the London and Paris markets, notwithstanding the fact that both the Bank of England and the Bank of France made further advances in their selling prices of the yellow metal, in order to check the outflow of gold to this side. Private discounts are higher at London, and it is expected in some quarters that further efforts will be made by the Bank of England to prevent imports of gold to this side on a large scale by advancing its discount rate later in the week. Up to the present time the amount of gold engaged is approximately $22,000,000. This does not include the $2,000,000 secured by a Boston institution, or the $2,000,000 engaged in the Australian market. Of this amount the Sub-Treasury has advanced to local institutions about $16,000,000, which was made immediately available for market purposes. Notwithstanding these heavy engagements of gold the foreign exchange market has ruled at a point which makes further engagements of gold for import permissible, providing the Bank of England does not make further efforts to keep its gold supply intact. The demand upon New York banks by interior institutions has continued heavy, and was reflected in the bank statement published on last Saturday. According to that document the clearing house banks lost nearly $16,500,000 in cash, and there is every indication of a continuance of the outward movement of money on a large scale for some time to come. Other features of the bank statement were a contraction in loans of nearly $12,000,000 and a decrease in deposits of $27,843,100. The reserve required was $6,960,775 less than in the preceding week, but the surplus reserve was entirely wiped out and a deficit of $6,577,925 created in its stead. The surplus in the corresponding week of last year was $4,831,350; in 1904, $38,438,250; in 1903, $15,372,200; in 1902, $715,075; in 1901, $7,110,550, and in 1900, $26,056,250. This deficit, however, has been more than restored by the advances made by the Sub-Treasury on gold engagements abroad. At the close of the week the market continued firm, with premiums demanded on all fixed periods, and indications point to a continued firm market in the near future.

The Stock Market

Although the price movement was feverish and irregular, and fluctuations were wide, the general trend of values on the Stock Exchange this week was toward a higher level. The really important development of the week was the action of Secretary Shaw in restoring the Treasury policy of advancing to national banks the amount of gold engaged for import. This was followed by the engagement of about $22,000,000 of the yellow metal, and it is the general belief that at least $25,000,000 gold will be imported in the near future. The advances by the Treasury save the importing banks the amount of interest on gold in transit from the other side, and is of great advantage and acts as an offset to any temporary firmness in sterling exchange. The monetary situation had become critical, and the rates for call loans reached a point which prohibited borrowing for speculative purposes. The Treasury announcement was followed by a sharp drop in the lending rate on call and lower rates on time. The net loss of cash by the New York banks for crop moving and other purposes amount to about $30,000,000 since the beginning of the outward movement, and if this amount of gold can be drawn from abroad, the banks will be in a position to extend more liberal accommodations to merchants and also to lend more freely for speculative purposes. If gold imports fall below expectation the Treasury is in a position to help out by deposit of public funds in national banks in the West and South, and thereby minimize the demand which otherwise would be made upon New York for funds.

The market has been stimulated by persistent rumors of deals and increased dividends. The most important of these has relation to the probability of control of the St. Paul by the Southern Pacific and the consequent abandonment of the proposed extension of the St. Paul to the Pacific Coast. The annual report of the Atchison showed surplus earnings of over 12 per cent for the common, and this stock advanced sharply, on the belief that at the October meeting the dividend on the common will be increased to a 6 per cent basis. The coal stocks were influenced by large earnings and by the action of the Pennsylvania in disposing of part of its investment holdings. An early announcement of the lease of the iron ore lands of the Great Northern to the Steel Corporation is expected, and the terms of the contract are said to be very favorable to the latter, while at the same time the deal will add largely to the income of the Great Northern. The trading in the steel shares has been chiefly in the common, the preferred having received little attention. The so-called Morgan stocks have been laggards in this bull market, but Erie came to the front during the week and made a good advance on heavy trading.

The stock market is likely to be governed by rumors or announcement of one or more of the long-discussed deals and by the developments in the money market. The Government crop report is bullish on stocks, and with large harvests and good prices for grain the prosperity of the country is assured. Politics have ceased to be a menace, and while a Congressional campaign is not to be regarded as a bull card, it will not this year have any adverse influence. Sentiment continues bullish, and the very unfavorable bank statement was not only ignored, but was followed by an extraordinary buying of stocks. The general situation favors a strong market, but there is a tendency to hold any reckless speculation in check.

Philadelphia

Trading in the local traction issues was extremely quiet during the week and prices generally yielded under light pressure. Philadelphia Rapid Transit, which was the most active feature of the group, opened at 29, and after a decline to 28 advanced to 29¼. About 3000 shares were traded in. Philadelphia Traction was exceptionally strong, several hundred shares selling at 100, the highest price recorded for some weeks past. At the close it sold at 98 ex. the dividend. Union Traction was under pressure, the price running off from 64¾ to 63½, on sales of about 600 shares. American Railways broke from 52¼ to 50⅞, on sales of odd lots, and recovered at the close to 51¼. Other sales included Frankfort & Southwark Passenger at 448, Philadelphia Company common at 49⅞ and 49½, Union Traction of Pittsburg preferred at 51, and United Companies of New Jersey at 258 and 254⅞.

Baltimore

The market for tractions at Baltimore has ruled unusually quiet and without material change in prices. United Railway 4s furnished the active feature, about $50,000 selling at 89½ and 89¼. The funding 5s brought 88½ and 88⅜, and the income trust certificates brought 69¾ and 69½. North Baltimore Railway 5s were exceptionally strong, $11,000 selling at 115 and 116. Norfolk Railway & Light 5s sold at 100, and Charleston Consolidated Electric 5s changed hands at 95 and 94¾.

Other Traction Securities

In the Chicago market the traction issues were practically neglected, but such transactions as were made were at slightly higher prices. Chicago Union Traction sold at 5¼, while the preferred advanced to 20⅛ on light purchases. West Chicago opened at 32½, and after declining to 31 recovered to 32. In the Boston market interest centered largely in Massachusetts Electric issues, the common stock advancing from 19¼ to 21, on the exchange of about 1500 shares, while the preferred rose from 70 to 73½, on the purchase of about 1700 shares. Boston Elevated opened weak at 150¼, but it subsequently rose to 153½, on purchases of odd lots.

Boston & Worcester common sold at 34 and 33¾, and the preferred at 83 to 82 and back to 82½. West End common sold at 96½ and 97, and the preferred at 108½.

There was little activity in tractions in Cincinnati last week. Cincinnati, Newport & Covington preferred sold at 97¼ for several lots, and Cincinnati, Dayton & Toledo sold at 27¼ for several small lots. The 5 per cent bonds of this company were active at 93. Cincinnati Street Railway sold at 143.

Cleveland Electric advanced to 71 this week on indications that the company is gaining friends for its franchise renewal proposition. There were a few scattered sales on the certificates of the Forest City Railway Company, the new low-rate company at 94. Lake Shore Electric common showed considerable activity at 16. Cleveland & Southwestern common sold at 15¾ and the preferred at 60; there are strong indications that dividends on this stock will be started again early next year. A block of Detroit United sold at 94⅜. Northern Ohio Traction & Light sold at 28½. Washington, Baltimore & Annapolis securities have been quite active of late. Several lots of the underwriting were sold at 109¼, and several small lots of the stock sold at 13¼ and 14, par value $50. There was a rumor to the effect that the Sherwin-Bishop syndicate, which is promoting this road, had sold the bonds on the property at 90 to an Eastern syndicate. Geo. T. Bishop, one of the syndicate managers, says there is no truth in this. The bonds will probably not be sold until the road is completed.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Sept. 5	Sept. 12
American Railways	52	51¾
Boston Elevated	159¼	153½
Brooklyn Rapid Transit	78⅛	80¼
Chicago City	160	160
Chicago Union Traction (common)	5	4¾
Chicago Union Traction (preferred)	19¼	18
Cleveland Electric	—	71
Consolidated Traction of New Jersey	79	—
Detroit United	93¾	93
Interborough-Metropolitan, W. I.	37¾	38¼
Interborough-Metropolitan (preferred), W. I.	78½	77¾
International Traction (common)	—	54½
International Traction (preferred), 4s	—	76
Manhattan Railway	146	147
Massachusetts Electric Cos. (common)	19½	20
Massachusetts Electric Cos. (preferred)	70	72
Metropolitan Elevated, Chicago (common)	26	26
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	106	106
North American	91¾	91
North Jersey Street Railway	27	27
Philadelphia Company (common)	†49½	49½
Philadelphia Rapid Transit	28	29
Philadelphia Traction	99	*98
Public Service Corporation certificates	69	69
Public Service Corporation 5 per cent notes	94½	94½
South Side Elevated (Chicago)	96½	96
Third Avenue	125	124
Twin City, Minneapolis (common)	114½	113
Union Traction (Philadelphia)	64½	63
West End (common)	—	—
West End (preferred)	—	—

* Ex-dividend. † Ex-rights.

Metals

According to statistics collected by the "Iron Age," the production of pig iron by the steel companies declined during August to 1,237,485 gross tons, as compared with 1,323,391 tons in July, and the record of 1,400,395 tons in March. The number of active furnaces is increasing and relief is promised, but it can hardly be expected that it can come this month. Just how the situation lies with the foundry iron cannot be clearly indicated, statistically, because of the refusal of many makers to report on stocks on hands. The excitement in the foundry iron trade has subsided. The steel scarcity is acute. The next heavy purchasing movement seems destined to develop in steel cars. There is a heavy movement in wire and tubes. Foreign markets are strong.

Copper metal is strong and ⅛ to ¼c. higher at 18⅞ to 19⅛ for Lake, 18¾ to 19 for electrolytic and 18½ to 18¾ for castings.

DETROIT COMPANY OUTLINES ITS POLICY

An important session of the City Council was held in Detroit last week, at which the question of franchise extensions for the Detroit United Company was again considered. Perhaps the most important information elicited was that from Assistant General Manager Brooks, of the company, who said most positively that the company will not accept a franchise on the basis of eight tickets for 25 cents. He also said the company will not agree to any extension of the time of issuance of workingmen's tickets beyond the limits proposed in the Codd-Hutchins franchise. Mr. Brooks stated to the committee that the proposed rates of ten tickets and six tickets for a quarter in the new franchise would reduce the revenues of the company $700,000 a year, while a straight eight-for-a-quarter rate would reduce the revenues $400,000 more, and that it would be impossible for the company to operate and pay its interest and other charges under such a reduction of $1,100,000 in its yearly revenues.

W. R. KIMBALL GETS OPTION ON SYRACUSE & SOUTH BAY PROPERTY

An option upon all his claims against the Syracuse & South Bay Railroad has been given by William M. Brown to the W. R. Kimball interests. Mr. Brown, it is said, has named the amount which he will take for his $250,000 worth of notes of the Bay Road Construction Company, which are secured by $300,000 worth of bonds of the Syracuse & South Bay Railroad Company, and all other claims which he holds against the enterprise. Besides the $250,000 in notes Mr. Brown is a creditor for nearly as much more. It is learned that the intention is to form a new company and to make a compromise settlement with all the creditors of the enterprise, part to be paid in cash and part in stocks and bonds. This would include a payment to the creditors of W. B. Burns and W. K. Niver, which would probably prevent the bankruptcy proceedings against them from taking their course in the courts.

Creditors have already been approached with the plan, and it is said some of them have signed. What the terms of Mr. Brown's option are is not known. It is reported that New York capitalists are to finance the venture, paying Mr. Brown, the creditors of the road and the creditors of Mr. Niver and Mr. Burns a portion of their claims. This would mean that $500,000 would have to be raised. The creditors once before signed a reorganization plan with one or two exceptions, but it was blocked by the suit of Averill & Gregory against W. M. Brown, which was tried in the courts and recently decided in favor of Mr. Brown. Provided Mr. Kimball is successful the road will be finished this fall so as to save the traffic agreement with the Syracuse Rapid Transit Company, which expires Jan. 1.

QUARTERLY MEETING OF THE NEW YORK STATE ASSOCIATION

The next quarterly meeting of the Street Railway Association of the State of New York will be held at the Fort Orange Club, Albany, N. Y., on Wednesday, Sept. 19. The conference will be devoted to mechanical subjects, and the session will be opened at 11:30 a. m. There will be reports by special committees on "Car Braking" and on the "Proper Height of Car Steps for Street and Interurban Cars." The committee on "Collection and Compilation of Mechanical Costs," which was continued from the Saratoga convention, will also make a report.

A portion of the afternoon session will be known as "A Trouble Meeting," and will be devoted to a discussion of mechanical troubles. At this session opportunity will be given to ask any questions or bring before the conference any special mechanical problems, and the best methods of remedying some of these troubles will be brought out.

This quarterly conference promises to be one of the most valuable ever held under the auspices of the association, and a large attendance of operating and mechanical men is expected. Anyone interested in electric railway mechanical topics, who is connected with an electric railway company, either in New York State or any of the neighboring States, is cordially invited to attend the meeting and take part in the discussions.

REVENGE BY RAILROAD AND EXPRESS COMPANIES ON TROLLEY PATRONS

In a remarkable petition filed with the Interstate Commerce Commission at Washington on Thursday, Sept. 6, by J. E. Walker, of Media, Pa., the Baltimore & Ohio Railroad and the United States Express Company are charged with punishing people who patronize a trolley line in competition with the railroad by a system of blacklisting. The complaint maintains that package express rates for sending goods out of Philadelphia to suburban towns were established in 1890 by the express company, and that he, with numerous other citizens, enjoyed the benefit of those rates on parcels from Philadelphia on defendants' lines. In 1902 an electric railway was built to the town of Hockessin, Del., 39 miles from Philadelphia, he avers, and presently it developed that the express company's agents would not accept packages for delivery to persons who were riding on the trolley cars. When a parcel was offered, the agent would consult a list he kept of the patrons of the trolley line. It is alleged that this was a blacklist and that in punishment for riding on the trolley cars the privilege was denied to the persons listed of sending their goods at the package rates.

ANNUAL REPORT OF THE BROOKLYN RAPID TRANSIT COMPANY

A short abstract of the report of the Brooklyn Rapid Transit Company. Report of the board of directors to the stockholders for year ending June 30, 1906, was published in the last issue of this paper. A fuller abstract follows:

The subjoined table shows a comparative statement of the results of the operations for years ending June 30, 1906-1905.

	1906.	1905.	Increase or Decrease.
Gross Earnings from Operation	$18,473,328.10	$16,333,444.59	+ $2,139,883.51
Operating Expenses	10,441,377.37	9,803,870.32	+ 637,507.05
Net Earnings from Operation	$8,031,950.73	$6,529,574.27	+ $1,502,376.46
Income from Other Sources	323,935.62	252,135.63	+ 71,799.99
Total Income	$8,355,886.35	$6,781,709.90	+ $1,574,176.45
Less Taxes and Fixed Charges	5,612,934.23	5,178,491.55	+ 434,442.68
Net Income	$2,742,952.12	$1,603,218.35	+ $1,139,733.77
Out of which was taken for Betterments and Additions to Property	580,342.87	453,284.87	+ 127,058.00
Surplus for the Year	$2,162,609.25	$1,149,933.48	+ $1,012,675.77
Surplus for June 30, 1905-1904	984,723.20	1,594,189.72	— 609,466.52
Surplus June 30, 1906, and June 30, 1905	$3,147,332.45	$2,744,123.20	+ $403,209.25
Of this amount there has been appropriated:			
Old accounts written off	522.98	......	+ 522.98
In adjustment of Supply Accounts	......	12,600.00	— 12,600.00
For Discount on Bonds Sold	571,246.66	1,746,800.00	— 1,175,553.34
Contingent Reserve Fund	500,000.00	......	+ 500,000.00
Total Appropriations	$1,071,769.64	$1,759,400.00	— $687,630.36
Balance Surplus June 30, 1906, and June 30, 1905	$2,075,562.81	$984,723.20	+ $1,090,839.61

The statement given below shows division of gross earnings for the last year:

		Increase.	Per Cent 1906 over 1905.	Per Cent 1906 over 1904.
Passenger:				
Surface	$11,531,125	+ $1,186,014	11.46	18.18
Elevated and Bridge	6,055,597	+ 751,308	14.16	29.62
Freight, Express, Mail, etc	740,799	+ 180,266	32.16	283.92
Advertising	145,807	+ 22,296	18.05	9.91
Total	$18,473,328	+ $2,139,884	13.10	25.20

The total earnings from operation for the twelve months ending June 30, 1906, show an increase of $2,139,883.51 or 13.10 per cent over the previous fiscal year.

The percentage of operation to earnings is 56.52 per cent for 1906, as compared with 60.02 per cent for 1905.

The net earnings from operation for the twelve months ending June 30, 1906, show an increase of $1,502,376.46 or 23 per cent, as compared with the twelve months ending June 30, 1905.

SOME OF THE PROPERTY ADDITIONS AND IMPROVEMENTS

One hundred steel-framed fire-proofed convertible elevated motor cars, with center aisle and reversible seats, having a seating capacity for sixty passengers, have been received during the year and placed in operation. The work of rebuilding steam coaches for electrical operation has been completed, and the elevated passenger equipment now consists of 558 motor cars (320 of which are of a convertible type), and 269 closed trailer cars. The motor cars are equipped with two 150-hp motors, multiple-unit train control and automatic air brakes.

Two hundred and twenty-two convertible surface passenger cars have been received during the year, and 144 additional remain to be delivered. Six hundred and sixteen closed cars have been equipped with vestibules and 347 additional sets have been ordered. The company will have 1215 vestibuled cars in operation during the coming winter. Upwards of 1000 surface cars have been equipped with new fenders.

Two electric locomotives have been built in the company's repair shops. Four standard steel frame digger bar snow plows have been received, and ten box cars, twenty gondola cars and one snow sweeper are to be delivered during the present summer, available for use Sept. 1.

One turbo unit of 7500-kw capacity and one turbo unit of 5500-kw capacity have been put in operation at the Williamsburg power station. Three additional 7500-kw turbo units have been contracted for, one of which will be in operation by Nov. 1, 1906, and the other two before the summer of 1907.

Two new sub-stations have been put in operation, viz.: southern sub-station, 2000-kw capacity; Myrtle Avenue sub-station, 4000-kw capacity.

Four additional sub-station buildings are under construction and will be completed and put in operation during the ensuing year, viz.: New Utrecht sub-station, 2500-kw capacity; Canarsie sub-station, 1000-kw capacity; Hudson sub-station, 6000-kw capacity; Richmond Hill sub-station, 1500-kw capacity. Each building will be constructed of ample size to admit of additional installations.

Two additional sub-stations will be constructed during the next year, the land for which has been acquired and the apparatus contracted for, viz.: Corona sub-station, 1500-kw capacity; Lexington sub-station, 4000-kw capacity. The Coney Island and Parkville sub-stations have each been increased by 1000-kw capacity by the installation of additional convertors and static transformers.

Over 65 miles of duct have been laid in 8.5 miles of underground subway. Forty miles of high tension and 14 miles of low-tension feeder cables have been installed in subway conduits, and upward of 50 miles of overhead feeders have been installed.

The reinforcement of the elevated structure is progressing satisfactorily. The work of cleaning and repainting 50,000 ft. of structure contracted for last year has been completed and work is under way on 60,000 ft. additional. Two and four-tenths miles of single track have been relaid with standard 80-lb. rail.

Platforms have been lengthened on the Prospect Park and Coney Island and West End divisions for six-car elevated train operation and new platforms have been constructed on the Sea Beach division to provide for local elevated service. Four thousand lineal ft. of elevated platform extensions have been constructed during the year to accommodate six-car trains, and similar work is now under way at stations on the Myrtle Avenue division.

The new elevated yard at East New York with capacity for 327 cars and the elevated repair shop, inspection sheds, etc., are completed. The surface storage yard adjoining the elevated yard is also completed and has a capacity for 287 cars. These yards are divided into sections by fire walls built under specifications approved by the New York Fire Insurance Exchange, the surface yard having two storage compartments, and the elevated three compartments, exclusive of shop and inspection tracks.

Repair shop, inspection sheds and storerooms have been erected on the company's property east of Fifth Avenue between Thirty-Sixth and Thirty-Seventh Streets and the serviceable machinery and tools are being transferred from the old shop to the new shop. The old building will be removed to provide additional car-storage space in the elevated yard.

The new repair shops for elevated cars at East New York were put into service in January, and those at Thirty-Sixth Street and Fifth Avenue are nearly ready for operation. Attached to these plants are commodious inspection sheds, oil and

waste houses, store rooms and all appurtenances necessary to first-class plants of this character. The ultimate capacity of these shops will be sufficient for the requirements of the company for many years.

The Thirty-Ninth Street repair shop at Thirty-Ninth Street and Third Avenue has been converted into a paint shop for both elevated and surface cars and a storage house constructed on Third Avenue adjacent to the repair shop for the storage of paints, oils, etc.

A new car house and storage yard of large capacity have been completed on Tenth Avenue between Nineteenth and Twentieth Streets and a two-story depot is under construction on the westerly half of the block, fronting Ninth Avenue. Plans are being prepared for a new surface depot and storage yards to replace the present Maspeth depot. This improvement will be completed during the coming year. An emergency crew station has been built on Fourth Avenue near Thirty-Eighth Street.

A new ash-receiving station has been erected at Bushwick Avenue and Gillen Place, East New York; also an incinerator plant for the burning of refuse, equipped with boilers, the steam being utilized for heating the adjacent buildings and furnishing power for the operation of compressors and steam hammers in the repair shops at this location. Baling presses have been installed at nine ash-receiving stations, to permit of the economical transportation of refuse to the incinerator plants. Steam pipes have been installed for the utilization of steam from the Third Avenue incinerator for heating feed-water in the adjoining power stations.

Extensive improvements, consisting of pits, cranes, hoists, new tracks, renovation of buildings and installation of fire lines and hydrants are under way at the East New York and Ridgewood depots. Fifteen thousand six hundred and ninety-six joints, or 75 miles of single track, have been electrically welded and tracks thoroughly repaired. A new electro-pneumatic interlocking plant has been erected near the junction of Broadway and Jamaica Avenue and an all-electric interlocking plant has been installed at Thirty-Sixth Street and Fifth Avenue.

The peculiar track geography of Brooklyn makes the transfer question more than ordinarily difficult to deal with. The fact, for example, that one may start from the Manhattan end of the New York and Brooklyn Bridge, and by the use of transfers work his way over some 30 miles of lines, and end up at the place of beginning, for one fare, is not without practical demonstration. The tendency to abuse the transfer privilege by manipulation, trading through agencies and the practice of other illegitimate methods by a class of operators, to whom the opportunity is sufficient excuse, increases with its extension, and to same unknown but very considerable degree unduly burdens the company and discomforts the paying passenger. The serious aspect of this feature of the street car traffic can be appreciated only by those having the problem to deal with; but the following may be of interest as showing its growth during the last two years in Brooklyn. In March of this year, the transfer privilege was materially extended. In May following, the points of transfer were increased in number and restrictions still further removed. In June month there were issued 12,700,000 transfers, against 7,300,000 in June, 1905, an increase of 75 per cent. For the year ending June 30, 1904, the number of transfers collected was 56,804,382 or 19.40 per cent of all cash collections. In the year next following the number was 70,080.877 or 22.24 per cent. In the year ending June 30, 1906, there were collected 96,455,314 transfers or 27.26 per cent of the whole number of cash fares handled, and an increase of nearly 40,000,000 or 69 per cent over 1904.

CANARSIE RAILROAD COMPANY

The Transit Development Company, one of your constituent companies, has acquired during the year the entire capital stock of the Canarsie Railroad Company, a new company organized to take over property and franchises of the former Brooklyn and Rockaway Beach Railroad Company, consisting of about 3½ miles of steam railroad tracks and right of way from East New York to Jamaica Bay at Canarsie. The Long Island Railroad Company has agreed to pay an amount equal to one-half the cost of the acquisition of this property, and to join with the Canarsie company in the reconstruction of the roadbed where the railroads of the companies are parallel, in consideration of acquiring under long lease certain portions of the railroad which are not required by the Canarsie company. The railroad thus made a part of the system has since acquisition been rebuilt and equipped as an electric railroad, and, by means of a new elevated structure from Pitkin Avenue to New Lots Road, has been connected with the structure and tracks of the Brooklyn Union Elevated Railroad Company—thereby making a continuous route from Park Row, Manhattan, and Broadway ferries to Canarsie.

COMPARATIVE SUMMARY OF OPERATIONS FOR YEAR ENDING JUNE 30, 1906

	1906.	1905.	Increase + or Decrease —.	Per Cent
Gross Earnings.				
Passenger	$17,586,721.57	$15,649,400.80	+ $1,937,320.77	12.38
Freight, Mail and Express	309,554.67	219,640.90	+ 89,913.77	40.94
Advertising	145,807.50	123,510.81	+ 22,296.69	18.05
American Railway Traffic Co.	431,244.36	340,892.08	+ 90,352.28	26.50
Total Earnings from Operation	$18,473,328.10	$16,333,444.59	+ $2,139,883.51	13.10
Operating Expenses.				
Maintenance of Way and Structure	815,147.34	816,275.50	— 1,128.16	.14
Maintenance of Equipment	1,642,799.00	1,655,622.62	— 12,823.62	.77
Operation of Power Plant	1,609,534.19	1,421,386.64	+ 188,147.55	13.24
Operation of Cars—Trainmen's Wages	3,036,966.45	2,768,860.41	+ 268,106.04	9.68
Operation of Cars—Other Expenses	1,214,370.83	1,148,942.33	+ 65,428.50	5.69
Damages and Legal Expenses	973,103.94	999,526.88	— 26.422.94	2.64
General Expenses	603,288.52	552,068.38	+ 51.220.14	9.28
Freight, Mail and Express—Expenses	203,961.90	139,515.04	+ 64,446.86	46.19
American Railway Traffic Co.—Expenses	342,205.20	301,672.52	+ 40,532.68	13.44
Total Operating Expenses	$10,441,377.37	$9,803,870.32	+ $637,507.05	6.50
Net Earnings from Operation	$8,031,950.73	$6,529,574.27	+ $1,502,376.46	23.01
Income F om Other Sources.				
Rent of Land and Buildings	59,656.41	59,741.28	— 84.87	.14
Rent of Tracks and Structure	97,302.93	101,504.27	— 4,201.34	4.14
Miscellaneous	166,976.28	90,890.08	+ 76,086.20	83.71
Total Income	$8,355,886.35	$6,781,709.90	+ $1,574,176.45	23.21
Deductions.				
Taxes	882,862.02	827,951.14	+ 54,910.88	6.63
Interest and Rentals—Net	4,730,072.21	4,350,540.41	+ 379,531.80	8.72
Total Deductions	$5,612,934.23	$5,178,491.55	+ $434,442.68	8.39
Net Income	$2,742,952.12	$1,603,218.35	+ $1,139,733.77	71.09
Special Appropriations	580,342.87	453,284.87	+ 127,058.00	28:03
Surplus	$2,162,609.25	$1,149,933.48	+ $1,012,675.77	88.06

CONSOLIDATED GENERAL BALANCE SHEET, JUNE 30, 1906

ASSETS.

Cost of Road and Equipment		$108,733,546.62
Properties owned in whole or in part by B. R. T. Co.		
Advances Account of Construction for Leased Companies		7,939,167.58
Brooklyn City Railroad	$7,221,478.84	
Prospect Park & C. I. R. R. Co.	717,688.74	
Construction Expenditures, Constituent Companies		4,506,274.84
To be reimbursed by issuance of B. R. T. 1st Refunding Gold Mortgage 4% Bonds, upon deposit with Central Trust Co., Trustee, of Certificates of indebtedness to cover.		
Guaranty Fund (Securities and Cash)		4,005,755.00
Underlying Bonds Deposited with Central Trust Co., Trustee		100,000.00
Treasury Bonds		1,075,500.00
B. R. T. 1st Ref. Gold Mortgage 4%	$943,000.00	
Other Issues	132,500.00	
Treasury Stock		146,228.00
Current Assets		3,665,299.11
Cash on hand	$2,001.558.65	
Due from Companies and Individuals	589,347.89	
Construction Material and General Supplies on hand	963,082.52	
Real Estate Mortgages	6,500.00	
Prepaid Accounts	104,810.05	
Bonds and Cash in Escrow covering Contractors' Deposits		42,120.00
		$130,213,891.15

NOTE.—The Certificates of Indebtedness issued by Constituent Companies aggregating $19,358,615.05 *against which B. R. T. Bonds have been issued*, do not appear separately on this Consolidated Balance Sheet, as the property purchased appears as an asset under the head of "Cost of Road and Equipment," and "Advances Account Construction for Leased Companies," and the liability is represented by the Bonds of the Brooklyn Rapid Transit Company, issued from time to time as such Certificates of Indebtedness are acquired and deposited with the Central Trust Co., Trustee.

LIABILITIES.

Capital Stock		$45,929,758.83
Brooklyn Rapid Transit Co.	$45,000,000.00	
Outstanding Capital Stock of Constituent Companies	929,758.83	
Bonded Debt and Real Estate Mortgages		78,690,680.00
Brooklyn Rapid Transit Co.	32,835,000.00	
Bonded Debt of Constituent Companies:		
Brooklyn Heights R. R. Co.	250,000.00	
The Nassau Electric R. R. Co.	15,000,040.00	
Brooklyn, Q. Co. & S. R. R. Co.	6,624,000.00	
Sea Beach Railway Co.	650,000.00	
Brooklyn Union Elevated R. R. Co.	23,000,000.00	
Real Estate Mortgages	331,640.00	
Current Liabilities		2,819,694.09
Audited Vouchers	$1,241,317.59	
Due Companies and Individuals	117,590.49	
Taxes Accrued and not Due	818,502.93	
Interest and Rentals Accrued and not Due	642,283.08	
Contractors Deposits		42,120.00
Long Island Traction Co. Trust Fund		9,344.19
Accounts to be Adjusted		24,045.59
Insurance Reserve Fund		51,428.27
Depreciation Reserve Fund		71,257.37
Contingent Reserve Fund		500,000.00
Surplus		2,075,562.81
		$130,213,891.15

CHANGES PROPOSED FOR DUDLEY STREET TERMINAL, BOSTON

To prevent passengers from clashing while hurrying to and from cars at the Dudley Street terminal, Boston, and also to lessen the chances of confusion which might result seriously during the busy hours, the Boston Elevated Railroad officials have presented a set of plans to the Railroad Commissioners to meet the new conditions arising with the advent of the eight-car trains, the opening of the Washington Street tunnel, and the extension of the elevated system to Forest Hills. These plans, if approved by the Railroad Commissioners, will make the Dudley terminal the "hub" of the system.

As it is now, there is much confusion among the passengers, and in a few instances fatalities have resulted. In order to obviate this condition and separate the elevated patrons from the surface car patrons, it is proposed to construct a platform nearly 400 ft. in length on the outer side of the loop on the Washington Street side of the station. By means of a new overhead bridge on either side, passengers can walk to the surface car platform and alight without coming in contact with those leaving the same car. Also at the Washington Street platform passengers can change for the south-bound trains. Across the loop, and on the opposite side of the present platform used for surface cars, an additional platform will be erected, so that persons leaving shall not meet those who are entering the cars. The idea is that these extra platforms will leave no chance for rushing. The old platforms for the surface and elevated patrons will be used as heretofore, while the proposed platforms will be used for loading exclusively. On the outer side of the Warren Street loop, another new platform will be built for loading surface car passengers. Cars will run between this platform and the old one, thus eliminating the meeting of passengers going in opposite directions. The new platforms will be connected by an overhead bridge, so that persons leaving the elevated trains at the Washington Street platform can walk along the bridge and then descend a few steps to the surface cars without meeting anybody coming from the other direction. Underneath will be a subway so that passengers can go to either end of the station without difficulty. The present trackage on the gradients will require a slight change to coincide with the proposed conditions.

When the Forest Hills extension is completed, the elevated trains instead of regularly swinging around the loop so as to make a return trip north will take the opposite direction to go to Forest Hills. This end of the system is expected to be completed early next year.

THE SAN FRANCISCO TRUCE—PUBLIC SYMPATHY WITH COMPANY

It is proposed that the action of the motormen and conductors of the United Railway of San Francisco in returning to work, as noted in the STREET RAILWAY JOURNAL for Sept. 8, will include not only the arbitration of differences between the carmen and the company, but also those of the linemen, electricians, firemen and construction workers now on strike.

The action of the carmen was practically forced by their national organization, and is a complete backdown from the position taken at a mass meeting several days ago. It was persistently rumored during the day that President W. D. Mahon, of the Amalgamated Association of Street Employees of America, with which the union is affiliated, had ordered the men back to work under threats of revoking their charter. This was denied by the leaders, who, however, admitted that they had received a telegram from Mahon, the contents of which they refused to give out, but which caused them to call the mass meeting.

Before the carmen struck, it is said that Mahon wired his disapproval of their contemplated action, stating the first principles of the national organization is arbitration by which, according to the contract between the carmen and the company, all disputes were to be settled. The resolution adopted by the union after several hours of heated discussion provides for an arbitration board of three members, one chosen by the carmen, one by the United Railroads, and these two to select the third.

The ending of the strike is a victory for President Calhoun, who has taken the stand from the first that he would not treat with the carmen or arbitrate until they returned to work.

ADVERSE REPORT ON T-RAIL AT HARTFORD

The special committee to which the Common Council of Hartford referred the petition of President Mellen, of the Consolidated Railway Company, for a franchise to occupy several streets with a double-track electric railway and T-rail in connection with the proposed fast interurban service between Hartford, New Britain and Waterbury, has adopted a report which in effect denies the application. Although the committee is unfavorable to the particular plan submitted by President Mellen, the report practically invites him to submit some other project. The report is not intended to be hostile to President Mellen's general scheme for combining trolley and steam systems in a rapid interurban electric service, but the streets and type of rail specified in the petition do not command the support of the municipal authorities.

The city authorities of Meriden have granted the petition of the Consolidated Railway Company to occupy several streets in connection with the proposed trolley between Meriden and Middletown. The action insures early commencement of structural operations. For a large part of the distance the steam tracks of the Waterbury, Meriden & Middletown branch, which will be equipped with an overhead trolley, will be used.

COMING MEETING OF CENTRAL ELECTRIC RAILWAY ASSOCIATION

Secretary Merrill, of the Central Electric Railway Association, has announced the program of the meeting to be held at Robinson Park, Ft. Wayne, Ind., Sept. 27. This being the first meeting after the summer vacation, the executive committee deemed it advisable that the meeting should assume a form of an outing, and for that reason Robinson Park, a beautiful resort on the line of the Ft. Wayne & Wabash Valley Traction Company, was selected. The meeting will be open for ladies, and the members are urged to bring members of their families with them. The management of the park has reserved the resort for the exclusive use of members and friends of the association, and has extended the courtesy of the free use of all the park attractions, and a special excursion by steamer has been arranged for the ladies. The program for the meeting is as follows: 11:00 a. m., business meeting; 11:15 a. m., "Lightning Arresters," paper by C. R. McKay; general discussion; 1:00 p. m., dinner; 2:30 p. m., vaudeville at the theater; 3:30 p. m., ball game, "Housers" vs. "Buckeyes;" 5:00 p. m., inspection of the power house of the Ft. Wayne & Wabash Valley Traction Company.

Secretary Merrill has made elaborate plans for the ball game, and he will be disappointed if they are not carried out. The members of the team will represent the prowess in athletic sports of the traction men of two States. Hugh J. McGowan, representative of the Widener-Elkins syndicate, Indiana, will be captain and manager of the Indiana team, and W. Kelsey Schoepf, representative in Ohio of the same syndicate, will hold a similar position for the Ohio team. Mr. McGowan has selected his team as follows: E. B. Peck, vice-president of the Indiana merger lines, pitcher; John W. Merrill, secretary, Central Railway Association, shortstop; A. W. Brady, president of the Indiana Union Traction Company, first base; Charles L. Henry, president of the Indianapolis & Cincinnati Traction Company, third base; William G. Irwin, president of the Indianapolis, Columbus & Southern, right field; C. D. Emmons, general manager of the Ft. Wayne & Wabash Valley, center field; C. C. Reynolds, general manager of the Indiana merger lines, left field; F. J. Wheeler, general passenger agent, Indiana merger lines, second base. The personnel of Captain Schoepf's "Buckeye" team is as follows: D. G. Edwards, vice-president, Indiana, Columbus & Eastern, first base; W. H. MacAllister, controller of the Cincinnati Northern, second base; E. C. Spring, president of the Central Electrical Railway Association, third base; J. L. Adams, general manager of the Indiana, Columbus & Eastern, second base; C. F. Smith, general manager of the Toledo Urban & Interurban, right field; C. M. Wilcoxson, general manager of the Cleveland & Southwestern, left field; F. D. Carpenter, general manager of the Western Ohio, shortstop. The substitutes on the Indiana team will be Frank D. Norviel, assistant general passenger agent of the Indiana merger lines, and H. A. Nichol, general manager of the Indiana Union Traction Company, and for the Ohio team they will be E. E. Darrow, general manager of the Toledo & Indiana, and J. R. Harrigan, general manager of the Canton-Akron. George S. Davis, of the STREET RAILWAY JOURNAL, will be umpire.

CLEVELAND TRACTION SITUATION

Mayor Johnson, of Cleveland, last week announced that he would be glad to see the proposition of the Cleveland Electric Railway referred to the vote of the people providing it was presented and explained in detail. He also insisted that the Cleveland Electric put up a bond to abide by the decision of the vote in case the Forest City Company secured the majority.

The Mayor has again broached the subject of the leasing of the property of the Cleveland Electric Railway to a holding company representing the city. It will be remembered that about a year ago the Mayor made a similar proposition offering to lease the company's property on a basis of $85 for the stock. Last week the officials of the Cleveland Electric replied to this proposition and agreed to lease the property on a basis of par or $100 per share for the stock with a guaranteed dividend of 4½ per cent; at present the road is paying 5 per cent dividends on this basis. Mr. Andrews intimated that his company not long ago received a proposition from the Everett-Moore syndicate to lease the property on a 5 per cent basis of par with a $3,000,000 guarantee. The Cleveland Electric's proposition is of course contingent on the granting of a franchise extension to the company. Mayor Johnson intimated that the proposition was altogether too high, and said that the city would make a counter proposition in a few days. His latest scheme is to lease both the Cleveland Electric and the Forest City Company to a holding company which shall give the city the benefit of any profits and turn the property over to the city at such time as the Legislature gives the city the right to operate street railways.

Frank DeHass Robinson, representing the Cleveland Traction Company, is endeavoring to secure consents, and claims it will make bids on several routes now sought for by the Forest City Company. It offers a 3-cent cash fare with universal transfers, with ten tickets for a quarter from 5 to 8 a. m. and 4:30 to 6:30 p. m., and to pay the city 2 per cent of its earnings the first five years, 3 per cent the second five years, and 5 per cent for the remaining five years. The property to become eligible for purchase by the city at the expiration of the grant.

THE POTTSVILLE COMPANY PLANS IMPROVEMENTS

The Eastern Pennsylvania Railways Company, Pottsville, Pa., which has in contemplation the making of extensions and improvement to aggregate, it is said, $1,000,000, has decided upon some of the new work to be carried out. For one thing, it is planned to build the extension from Pottsville and Shenandoah, and from Middleport to Tamaqua. The construction of this new line will be pushed vigorously so that a through line can be established between Pottsville and Mauch Chunk at an early date. With the completion of the Pottsville-Shenandoah section, practically all of the electric railways in Schuylkill County will be linked together forming a connected system of more than 100 miles of track under two managements as at present. This system is divided into two principal groups of railways. Pottsville and Mauch Chunk are terminals of the southern portion, while Mahanoy City and Shamokin are terminals of the northern portion. Between Mauch Chunk and Shamokin the extreme eastern terminus and the extreme western terminus will be a distance of 75 miles as surveyed. The system belonging to the Eastern Pennsylvania Railways Company will be rearranged as regards the supply and distribution of power for railway and lighting purposes. In the district where there are now half a dozen old power plants, there will probably be substituted two new modern plants.

THE RHODE ISLAND COMPANY'S TUNNEL PROPOSITION

The written proposition of President Marsden J. Perry, of the Rhode Island Company, for a tunnel in Providence is in the hands of Chairman Cooke, of the East Side committee. The city's credit is to be used through the issuing of bonds to a sufficient amount to pay for the work as it progresses. The Rhode Island Company is to pay the interest and principal of those bonds, and on the retirement of the last of these obligations is to take absolute fee and title. President Perry's proposition is that the tunnel shall be built under the joint engineering direction of City Engineer Clapp and Fred N. Bushnell, the constructing engineer of the Rhode Island Company. Mr. Perry proposes that Waterman Street shall be extended to Canal Street by the removal of the Arnold block and the business block in the rear, facing on Canal Street, and that the tunnel shall follow the line of Waterman Street as far as Benefit Street, thence under Fones Alley to a point on Thayer Street.

TEST OVER ATLANTIC CITY LINE

Last Tuesday a test was made by officials of the General Electric Company and the West Jersey & Sea Shore Railroad of the line between Camden, N. J., and Atlantic City, which is now being equipped with electricity and will be formally placed in operation Sept. 18. This was the first trip over the entire line, previous tests being confined to that part of the road between Newfield and Atlantic City. Details of the equipment of the line so far as they have been made public were given in the STREET RAILWAY JOURNAL for Dec. 23, 1905, and March 17, 1906.

CHICAGO MATTERS

The Chicago Street Railway Company, with capital stock of $5,000, was granted a charter by the Secretary of State at Springfield last week. Its avowed purpose, according to its promoters, is to bid in the property of the North and West Chicago street railway lines should they be offered for sale by court decree at the end of the receiverships. Attorney Jacob Newman, who said he represented bondholders in companies underlying Union Traction, with aggregate claims of nearly $1,000,000, caused the corporation to be formed.

W. W. Gurley, general counsel for the Union Company, has announced that the traction companies will reopen negotiations with the city, Sept. 15, when the valuations of the several properties again will be gone over.

Arguments on the validity of the Mueller law certificates have been resumed before Judge Windes, Attorney Samuel Adams appearing as special counsel for the city, and Frank H. Scott appearing for the complainants.

SOUTHERN PACIFIC AND ELECTRICITY

The question of using electric power for operating trains on the Southern Pacific Railroad over the Sierra Nevada Mountain division has been broached again, and rumor has it that Westinghouse interests are making a thorough investigation of the problem. The Southern Pacific is planning the construction of some tunnels on its mountain division so as to eliminate the heavy grades, but whether the matter of electric traction is under serious consideration is problematical. The report is spread periodically that electric traction is to be used by the Southern Pacific, but there is no outward evidence of such work.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED SEPT. 4, 1906

829,945. Railway Track Structure; William M. Brown, Johnstown, Pa. App. filed Jan. 4, 1906. A means for removably securing the center of an inter-section plate in position on the supporting bed or block. Has circular wedges which are driven into position to hold the parts together.

829,968. Railway Signal and Safety Appliance; Charles J. Kintner, New York, N. Y. App. filed June 6, 1904. The roadway is provided with special contact plates adjacent to the track rails which are engaged by the wheel flanges to operate the signal circuits. An additional feature relates to a train stop arm, which projects horizontally above the roof of the car, so as to be engaged by a semaphore signal set at danger position.

829,969. Safety Appliance for Railways; Charles J. Kintner, New York, N. Y. App. filed Jan. 27, 1905. Relates to additional features of the above and particularly the operating mechanism for the semaphore signals. The signals are motor actuated and have circuits to cut out the motors after a predetermined rotation.

830,020. Railway Rail Joint; Solomon J. Stever, Fairfield, Ia. App. filed Sept. 18, 1905. A suspended joint for railway rails designed to support the same when a joint comes between two ties. The fish-plates have underhanging flanges which extend beneath the base of the rail and are bolted together at such point.

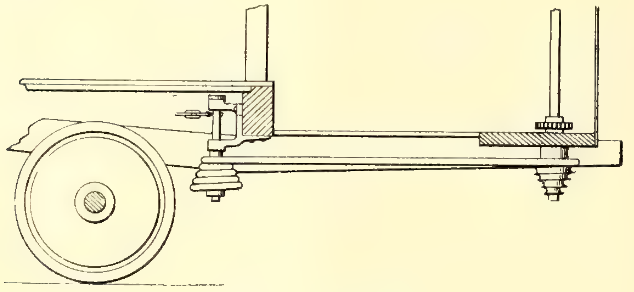
830,119. Control of Apparatus Governing the Passage of Cars or Vehicles Along a Railway; Herbert A. Wallace, New York, N. Y. App. filed June 13, 1906. Relates to signal installations of that class having insulated track sections charged with a direct current and connected to operate danger and caution signals. Patent specially relates to a train stop and the operation thereof.

830,131. Electric Railway System; William M. Brown, Johnstown, Pa. App. filed April 27, 1905. Railway of that class having

sectionally energized rail charged during the passage of a train by switches in the roadbed. Patentee has a magnet on the train which attracts the switches successively into circuit-closing relation, the magnetic circuit being completed through the collector shoe and third rail.

830,154. Car Brake; Peter M. Kling, Elizabeth, N. J. App. filed Aug. 21, 1905. Provides an adjustable fixture or part which is applicable to cars having depressed platforms. The purpose is to accommodate the brake chains beneath the platform in spite of the amount of their depression.

830,155. Car Brake; Peter M. Kling, Allegheny, Pa. App. filed Sept. 30, 1905. A device for taking up objectionable slack in a brake chain. The chain has a traveling support and a slanting guide for said support.

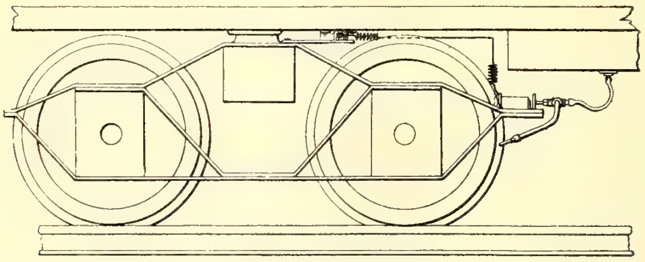


PATENT NO. 830,145

820,212. Car Protector and Rail Cleaner; Niels P. Danielsen, Council Bluffs, Ia. App. filed Dec. 2, 1905. A rotary brush in front of the car has a chain connection with the wheel axles through an intermediate gear whereby the direction of the brush is reversed.

830,241. Wheel Flange and Rail Lubricator; Andrew C. Love, Sacramento, Cal. App. filed Jan. 2, 1906. A source of lubricant is provided on the car, and electrically-operated valve connections with said source of supply are effective to deliver the lubricant to the track rail when desired.

830,247. Selective Signal System for Railways; Frank R. McBerty, Evanston, Ill. App. filed July 14, 1905. A complete signal installation for railways having means whereby the danger and caution signals are automatically set in operation, and by which a test circuit may be operated from two points of control, one operated in closing the semaphore, and the other by movement of a selector arm.



PATENT NO. 830,241

830,263. Passenger Car; Charles H. Turner, Brooklyn, N. Y. App. filed March 14, 1906. Relates to construction of car windows for steel-frame cars. Has a pocket for the car window and a cover for such pocket, and means for preventing the cover from being listed without first moving it in a horizontal plane.

830,363. Car Wheel; John A. Pilcher and Ward W. Lemen, Roanoke, Va. App. filed April 7, 1906. A car wheel formed of a single piece of metal having a rim constituting a treat section, a flange on the rim, a web or arched plate extending from the hub to a point opposite the flange and terminating in and forming a projection behind the back of the flange.

830,367. Automatic Switch Throwing Device; Clinton J. G. Rickerson, Colorado Springs, Col. App. filed May 22, 1906. A device for causing alternate movements of the switch point by repeated actuation of the operating part in one direction. The operating part has V-shaped cam grooves and a pivoted tongue which automatically controls the groove which shall be operative.

830,409. Trolley; Herschel L. Bryant, Tonkawa, O. T. App. filed Oct. 31, 1905. A pair of upwardly movable plates are hinged to the trolley harp and have link connections with the bearings of the trolley wheel whereby they are thrown upward whenever the wheel tends to leave the wire.

830,410. Car Seat; Edward G. Budd and Charles A. Conde, Philadelphia, Pa. App. filed May 19, 1905. A car seat of the "walk-over" type having arms depending from the back and a pair of levers pivoted at one end to one of said arms and at the other end to the frame. A form of pin gearing is used to insure simultaneous movement of the arms.

PERSONAL MENTION

MR. EDWARD C. BOYNTON has been appointed general manager of the Orange County Traction Company, of Newburg, N. Y. This line has been purchased by a Newburg syndicate headed by Ex-Governor Odell.

MR. ARTHUR REYNOLDS, of Fairfield, for a number of years superintendent of the Lewiston, Brunswick & Bath Street Railway, has been appointed superintendent of the Portland & Brunswick Street Railway Company.

MR. WARREN L. BOYER has been appointed superintendent of the New York Car & Truck Company, of Kingston, N. Y. This company has taken over the Peckham Works at Kingston and is now manufacturing and shipping Peckham trucks.

MR. EDWIN A. STURGIS, superintendent of motive power and machinery for the Worcester Consolidated Street Railway for two years, has been appointed superintendent of equipment for the Massachusetts Electric Companies, taking his new position Sept. 10. The vacancy at Worcester caused by Mr. Sturgis' resignation will be filled by the promotion of Mr. George W. Dunlap from the position of chief engineer of the Tremont Street power station.

MR. NORMAN McD. CRAWFORD, formerly general manager of the Hartford Street Railway Company, of Hartford, Conn., and a resident of that city for fifteen years, has accepted the office of vice-president of the Indiana, Columbus & Eastern Traction Company, the Lima & Toledo Traction Company and the Cincinnati Northern Traction Company. Mr. Crawford has a wide reputation as an electrical engineer. He has only recently returned from England, where he spent six months investigating electric street railways for the National Civic Federation. In Hartford his services in building up the local company are well known. As a contractor there in 1901 he put in the first section of the Glastonbury line and was retained as engineer. In 1894 he was made general manager of the company, and remained in that position until the Consolidated Railway Company, acting for the New York, New Haven & Hartford Railroad, took control last year.

MR. FRANCIS E. DRAKE, who has just been appointed general manager of the Societe Anonyme Westinghouse of Paris and Le Havre, has had an interesting career. Besides his earlier experience in the services of the Flint & Pere Marquette Railway, as telegraph operator, he had been five years sales manager of the Standard Electric Company, of Chicago, and nearly two years manager of the Walker Electric Company, Cleveland, when the United States Government appointed him director of machinery and electricity at the Paris Exposition (1900), for the purpose of organizing what was threatening shortly to become an embarrassing situation for United States exhibitors. When Mr. Drake arrived on the scene he found that, with careful pruning, and making a liberal allowance for withdrawals, the bona fide intending exhibitors required more than three times the space at his disposal. Few who remember the American electrical and machinery section of that year and its unique annex, housed apart in a beautiful building at Vincennes, are aware that Mr. Drake was responsible not only for the idea of a separate building, but also for its complete design, construction and lay-out. The idea was an immense success and gave great satisfaction to the American Government as well as to exhibitors, and resulted in his being decorated by the French Government. In 1901 Mr. Drake was appointed to reorganize the works of the Union Electricitäts Gesellschaft of Berlin, which he carried through and finished in 1903. The following two years found him again in America as president of the Lanyon Zinc Company, one of the largest zinc firms in the world. In April, 1905, Mr. Drake returned to Europe to organize the continental business of the Chicago Pneumatic Tool Company, and founded in Berlin the Internationale Pressluft und Elektricitäts Gesellschaft, m. b. H., of which concern he is general director. Mr. Drake is also a director of the Consolidated Pneumatic Tool Company, Ltd., of London, and a member of the Engineers' Club and the Lawyers' Club, of New York.

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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal, 8200 copies are printed. Total circulation for 1906 to date, 310,500 copies, an average of 8171 copies per week.

Accidents at Steam Road Crossings

Some statistics concerning accidents on street railway systems would, without doubt, show that a large per cent of these casualties is caused by collisions with steam trains at steam road grade crossings. This condition of facts is rather surprising when it is considered how easily accidents of this nature can be avoided. All that is necessary is that the conductor should signal the car over the crossing and exercise average intelligence in looking out for steam trains. The trouble is that orders are not obeyed. This is the case especially in crossings that are used infrequently by the steam trains. When but two or three trains pass over a line in twenty-four hours, the running time of these trains is apt to be very well known, and this fact makes the electric crew careless. They look upon the duty of flagging their car as a useless precaution and loss of time, and as there is seemingly no chance of an accident, the management often pays little attention to violations of the rule. It is, in fact, the spurs to factories and the less frequently used steam road tracks that are the most productive of accidents. The chance of being caught by the train is so infinitely small that trainmen after a time run over crossings of this character at full speed. When a steam train passes over the spur, the chances are great that the motorman will not be prepared to do anything to avoid an accident. And collisions at such crossings are usually of the most serious nature, due to the fact that the electric car is usually going at full speed.

The writer remembers an incident that caused the management of a railway to regard all steam road crossings in their proper light. Two very serious accidents happened at close intervals at just such crossings. One of these crossings was used probably not more than a half dozen times a year. In one instance a death resulted, and in both the electric cars were badly wrecked. Immediately after the accidents orders were given to the conductors to flag over every steam road crossing, no matter what its character, and the accidents due to collisions at crossings suddenly ceased.

Spitting on the Floors of Cars

The city authorities in several of the larger cities have recently begun the enforcement of long existing ordinances prohibiting spitting on the sidewalk. If spitting on the pavement is detrimental to the health of all and obnoxious to the majority of people, to expectorate on the floor of a badly ventilated car is certainly much more so. In most States and cities ordinances are in existence prohibiting spitting in cars, and we believe it high time for the railway companies which have not already done so to take advantage of these ordinances and start a vigorous crusade against those who persist in violating this rule of health and decency. That the ordinances are violated in many cities may usually be proven by a glance at the floor of many a car. Should there be no evidences in the aisles, if the car be equipped with cross seats, an inspection along the sides of the car between the seats will usually furnish sufficient proof. Many companies think they have done enough in the matter when they put up conspicuous notices in their cars requesting that passengers abstain from using the car floors as cuspidors, and also mentioning the fact that the offense is punishable by a fine. But such notices, while they serve to remind the thoughtless ones, have no effect whatever on the willful violators. Conductors at times have instructions to make personal requests of violators and often to threaten them with arrest, but the effect

of such requests and threats is not much more effective than the posted notices. To stop the practice effectually, vigorous action must be taken by the arrest and fining of a few of the offenders. Such action on the part of the railway company would usually result in enough newspaper publicity to cause the company's attitude to become generally known, and afterwards there would be a decided change for the better in the condition of the cars. This at least has been the experience in cities where the ordinance against spitting on the sidewalks has been enforced. In one of the larger cities a comparatively small number of arrests of violators and fines of $1 and cost for each, put an effectual stop to the practice. In the work the city authorities were assisted greatly by the newspapers, who took up the city's side and let the determination of the company and the city authorities to stop the practice be generally known. Railway companies may urge as a reason against taking vigorous action that they would arouse the enmity of a certain class of people and thereby lose patronage. But we are inclined to believe that the reverse would be true. A greater number of people would appreciate the company's efforts to better conditions, and the general sentiment of the community toward the company would, without doubt, be better. People would further appreciate the cleaner condition of the cars, and it is safe to say that the increase of travel, due to the change of condition of car floors, would more than equal the lessened travel by those affected by the action of the company. However, the blame for the continuance of the practice of spitting on the floors does not always rest on the operating companies. Often when the companies do attempt to punish offenders, such action meets discouragement at the hands of the municipal authorities. At times these latter seem to consider spitting on the floor of a car too small an offense to deserve punishment, and accordingly refuse to punish those against whom the operating companies may prefer charges. Cars can only be kept clean when the municipal authorities and the railway company work in harmony.

The Lighting of Street Cars

Now that the short days of autumn draw near, the question of car lighting comes again to the front. Within the past two or three years there has been keen interest in improved methods of illumination, and they have gradually been put upon a scientific basis. We wish that the electric car would receive its fair share of attention—it needs it sadly. It is not that electric railways are at all parsimonious about their light; on the contrary, they sometimes err in the direction of too great liberality. Unquestionably a street car is from its shape and finish somewhat difficult to light satisfactorily, which is an excellent reason for making an especial effort to solve the problem. We shall therefore feel at liberty to discuss this subject again, and shall try to put a new phase upon it, although it has been considered several times before in these columns.

Speaking in general terms, illumination is effective in the proportion that it falls upon the objects which are to be lighted and keeps out of the eyes that are working by it, subject of course to the condition that there shall be no violent contrasts of bright and dark spaces within the field of view. For irremediable badness, the favorite method of reading a newspaper in the days of our great-grandfather easily takes the palm. The old gentleman would lean a bit forward on his desk, grasp the paper firmly in his right hand, and then with the left shove a lighted candle about midway between his nose and the type. By this means the light would shine fairly above his spectacles, which he would be obliged from time to time to readjust in the hope of seeing a little more through the glare.

Now, nine street cars out of ten are lighted very much after the same fashion, so far as results are concerned. The lights are commonly incandescents with clear bulbs arranged on a rather low ceiling or on the sides of the car in such positions that they shine full in the faces of those who attempt to read by them. Under this assault the iris contracts in self-defense and the light that actually falls upon the paper is proportionately ineffective. To get good results in car illumination, as elsewhere, one should endeavor to keep bright sources of light out of view while giving plenty of light for reading purposes. Plainly, this is hard to manage in a street car, since the occupants face in opposite directions and may fill the standing room, while the space to be lighted is directly in front of them. The ideal direction of lighting, slightly from the rear, cannot be followed out, since there is no rear with respect to all the passengers. The next best thing is to light nearly from above—a plan which can be carried out, but which is quite generally mismanaged. To get good results in so contracted a place as a car, the first requisite is the use of frosted lamps, or at least lamps behind diffusing screens, to cut down the intense brilliancy of the filaments. Second, these lamps should be so placed as to be screened from the side of the car opposite to that which they are directly intended to illuminate. Probably the best location is that just outside the monitor roof, in about the place now sometimes used, but so screened, or preferably recessed, as to be practically invisible from the opposite side of the car. Lamps so placed will give all the light necessary without being in the least obtrusive.

But how about standing passengers? The lights will be ordinarily out of their field of vision and still will throw out considerable useful light even for those who stand. There could be in case of necessity well-screened lights in the top of the monitor as auxiliaries. The chief requisite is to get well screened lamps throwing a rather narrow stream of light where it will do the most good. It is possible that the "line o' light" lamps used somewhat abroad might be made robust enough to stand up in railway service, in which case a particularly good distribution would be possible. Failing these, an effort should be made to get behind the ordinary bulbs reflectors that would disperse light mainly in a direction lengthwise the car. A symmetrical reflector of angle wide enough to cover the length of the car properly without very closely spaced lamps, will throw light directly into the faces of those on the opposite seat. The long and short of the matter is, that to do car lighting properly, requires appliances carefully designed for that purpose. It is high time for some enterprising person to get into the field and work it. Cars with cross seats are much easier to manage, since one can light them very effectively from the roof, but even in this case well placed reflectors are capable of considerably improving the illumination and saving energy as well. The current now used for car lighting is more than sufficient to give first-class results if properly utilized. If one compares the number of incandescent lamps in a car with the number

required to illuminate brilliantly a room of the same area, the usual waste of energy is painfully evident. The car, of course, loses in its dark finish and many windows, but gains in the comparatively low ceiling which brings the lamps nearer to the plane on which illumination is desired. The car builders are those to whom we must look for improvement in this matter, since illumination should be a feature considered in car design.

A Low-Voltage Shop Trolley Circuit and Some of Its Advantages

Often the power house of a large railway system is located in close proximity to the repair shops, and considerable trouble is experienced thereby through the opening of the circuit-breakers in the power house and often the throwing of rotary converters out of phase by reason of heavy loads on the shop feeders, caused by defective motors on cars or by accidental short circuits occurring in the shops. The ordinary voltage employed on the shop trolley wires, moreover, often causes the burning out of rheostats under the cars when attempting to move cars slowly. In addition, the high voltage does not permit of slow and steady pulling of cars in switching, and in fact introduces so many difficulties as to cause the question to arise as to the advisability of supplying the shop trolley circuits with a voltage considerably lower, say even about half, that ordinarily used on the line.

The advantage of a reduced voltage will be understood by every shop man. Those gained in moving cars and in switching would especially be appreciated. With the voltage ordinarily used, in order to make a car move slowly, the motorman must continually work the controller alternately, turning the power on and off. When a heavy load is being pulled, this jerking of the train is objectionable and usually the only means of avoiding it is to run on the first resistance point, if this point will give the low speed desired. But if care is not exercised, and frequently it is not, the rheostats are likely to suffer under this latter method of handling the car. With about 300 volts on the shop trolley the car, when starting under a heavy load, would accelerate more smoothly, and throwing the controller to the series position would not usually give too great a speed. But if it should be found necessary to run on the resistance points, there would be very little likelihood of the rheostats getting too hot under ordinary treatment, as the current would be cut down to half what it is at present.

In addition to the benefits gained in switching and in moving cars, there would be other decided advantages with a lower voltage on the shop trolley. There is very little danger of a pressure of 250 or 300 volts seriously injuring any one who gets across the circuit with his hands or with any portions of his body. In fact, unless the contact is a very good one, such as might be caused by wet hands, the shock from a 300-volt circuit is so mild that it does not inspire that feeling of fear which most have when working with a 600-volt circuit. With this lower voltage, therefore, there would be no occasion for many of the usual safeguards for protection when working with "live" apparatus. Much time would be saved by the omission of these precautions; and further, the freedom from fear with which the car apparatus would be handled would permit a great deal of the work to be done more rapidly.

With regard to the fire hazard, marked benefits would accrue from a reduced voltage on the shop trolleys. Many car-house fires, it is safe to presume, have their origin in electric heaters which are left on over night in cars stored in the shops. The reduced voltage would be an effectual means of preventing fires from overheated electric heaters, as with half the current it would be almost impossible for the heaters to get hot enough to ignite the car.

About the only objection from the shop standpoint which occurs to us to the plan of lowering the voltage on the shop trolley is the effect it would have on the lights in the cars. The car lights are frequently employed to light the interior when repair work is being done on the car while in the shops or while the car is being cleaned. With the lower voltage, these lights would be practically of no benefit, as with about 50 per cent of the normal voltage on an incandescent lamp, the filament has only a red glow and does not give off much light. Electrically driven air pumps would work slower with the low voltage, and some other minor disadvantages might appear.

We admit, on the other hand, that if it were decided to supply the shop trolleys with a lower voltage, there would usually be considerable difficulty in bringing it about. It would be necessary either to place a resistance of a few ohms in the feeder from the power house or to put the shop feeder on a separate machine. Reduced voltage might also be obtained from a storage battery. The plan of using a separate machine would be preferable, but the cost of this extra machine would be rather a drawback in the first place, and in addition, as the load factor on a shop circuit is under ordinary circumstances very low, the machine supplying the circuit would run at a rather low efficiency for the greater portion of the time.

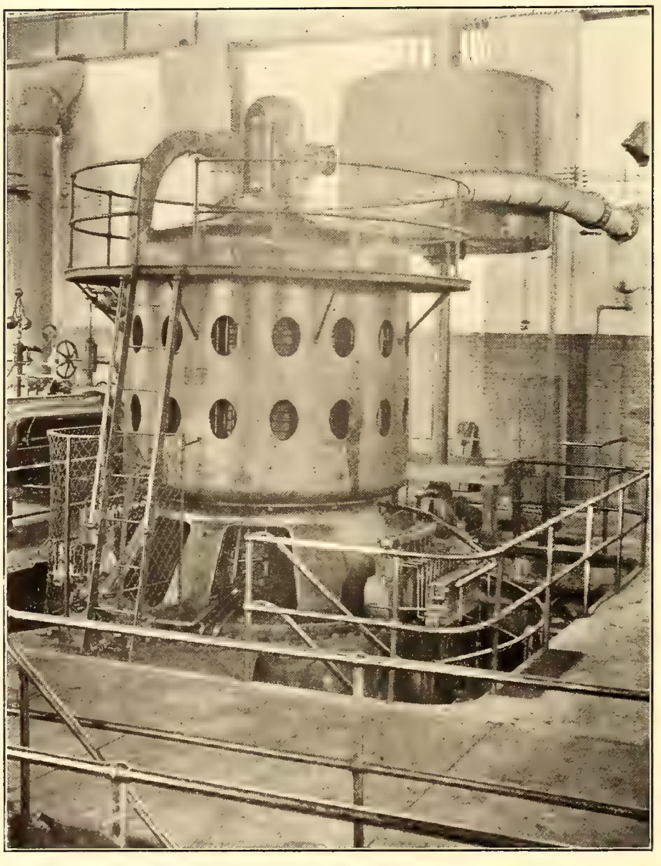
It would be very easy and very inexpensive to put a resistance in the feeder supplying the shop circuit, but this plan would not give all the benefits of a low voltage, as the voltage would fluctuate with the load. So far as pulling heavy loads and switching is concerned, the desired results would be obtained, but with no load on the circuit the voltage would be that of the generating machine, and the injury to a workman getting across the circuit would be the same as at the present time. And in addition the fire hazard would be about the same as at night. With only a load of a few heaters, these heaters would become about as hot as if there were no resistance in the feeder. A decided disadvantage would develop in that the men could not get accustomed to one voltage, and would consequently never know just how quickly a car was going to move when they turned the controller handle.

Wherever a storage battery is floated on the line and is available for connection, the desired voltage might be obtained by tapping in the shop feeder circuit, so that but half the total voltage of the line would be obtained. In such a case it would be necessary to connect the battery in two halves, and arrange switches and connections so that the two halves could be transposed to either the ground or the trolley side of the circuit. That half supplying current to the shop feeder would necessarily be connected on the ground side, and the fact that the shop circuit would have to be fed alternately from each half of the battery, in order to prevent over charging and over discharging of the battery, would necessitate the arrangements for transposition of the halves.

SOME IMPROVEMENTS ON THE CANTON-AKRON SYSTEM

The Canton-Akron Railway Company's property, which includes the interurban lines between Akron, Canton, Massillon, New Philadelphia and Uhrichsville, Ohio, and the city lines of Canton and Massillon, was quite fully described in the STREET RAILWAY JOURNAL of May 28, 1904, and constitutes one of the most important and progressive systems in Ohio. During the past six months the company has spent about $350,000 in improvements. They are in the way of refinements and additions to the equipment, which were not deemed essential when the road was new, but which became desirable after the property had been pretty well developed.

Important improvements were made in the power station, including the installation of machinery, which more than doubles the capacity of the station, and at the same time reduces the labor account. The new generating machinery was not absolutely necessary to maintain the operation of the road under normal conditions, but its installation provides a surplus of power which eases the work on all machinery and precludes the possibility of the system being tied up through the breaking down of one or even two units.

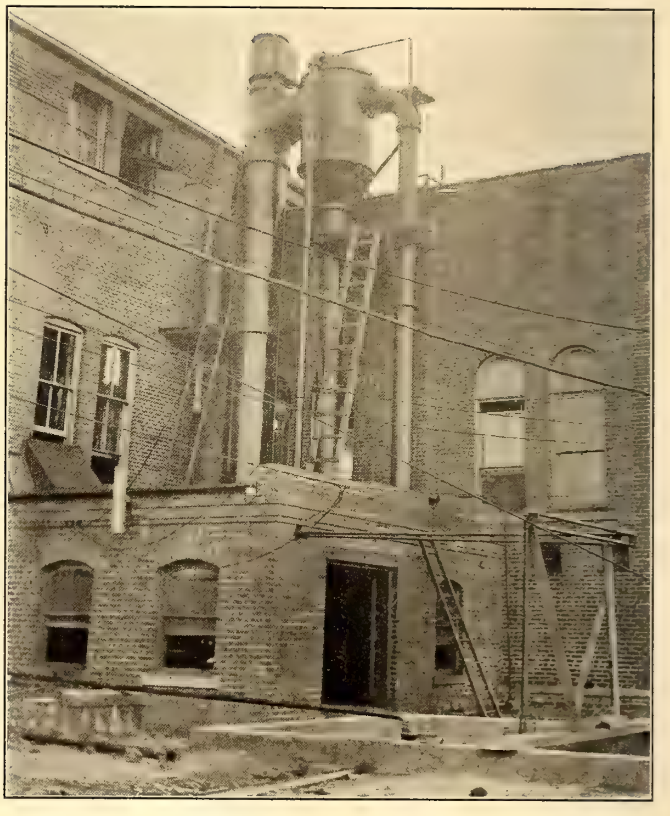


VERTICAL TURBINE INSTALLED FOR THE CANTON-AKRON RAILWAY

As outlined in the previous article, the system embraces about 70 miles of interurban road, equipped with heavy high-speed cars on hourly service, and about 22 miles of city lines, with double-truck city cars on 15-minute headway. The original generating equipment consisted of two 400-kw and one 800-kw General Electric three-phase, 13,200 volt, generators driven by Allis-Chalmers cross-compound engines. No space was provided in the station for additional units of similar type, and the installation of a 2000-kw Curtis turbo-generator and the increasing of the capacity of the station by 135 per cent without altering the buildings or moving any of the engines furnishes an interesting example of the space-saving qualities of this latest type of generating apparatus. The turbine occupies a space of 20 ft. x 30 ft. between the large engine and one of the smaller ones; considerably less space than is occupied by either one of the small units, although giving five times its capacity. The installation was made without disturbing any of the old equipment other than the shifting of some of the auxiliary pumps in the basement and the rearrangement of the piping. The turbine is of the four-stage type, with the electrically-controlled nozzles, and generates current at 13,200 volts, enabling it to operate in parallel with the other machine.

Back of the turbine is a Wood accumulator supplying 600-lb. pressure for the step bearing and maintaining its position for 15 minutes in case of accident to the step-bearing pumps. The turbine has been in operation for about six months and has given most satisfactory service. At one time it carried the entire load of the system for eight days without a shut-down, the other machines being out of commission.

The condenser outfit for the turbine consists of a 2000-hp Alberger barometric condenser placed on the outside wall of the building. Water for this is supplied by a motor-driven centrifugal pump, and air by a two-stage motor-driven air compressor mounted separately in a small pump-house outside the main building. In this there is also a 20 in. x 10 in. x 15-in. outside plunger packed boiler feed pump of sufficient capacity for 5000 hp installed by the Canton Pump Company, of Canton.



CONDENSER INSTALLATION FOR VERTICAL TURBINE

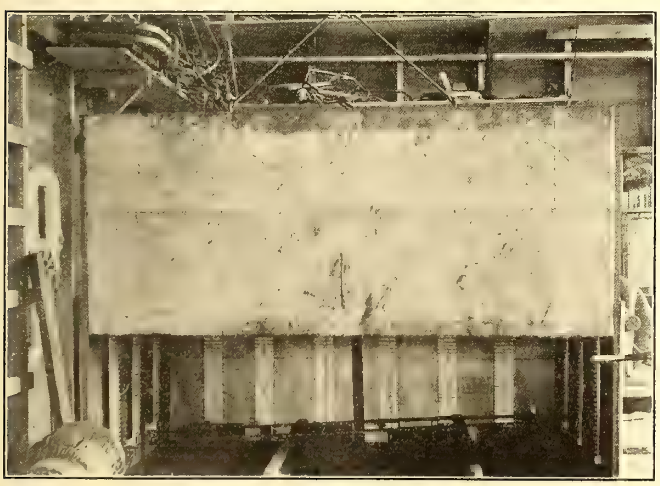
The original boilers consist of six 300-hp A. & T. boilers and two 300-hp Stirling boilers have recently been installed. These are equipped with the Model extension front grate and stoker, and the results with these have been so satisfactory that all of the other boilers are to be similarly equipped.

An interesting fueling outfit is being installed. At present there is a coal storage bin of 300 tons capacity alongside the boiler house. There is a trestle adjoining this, and fuel is discharged from side dump cars and handled by hand to the stokers. This bin is to be torn out and double tracks laid. A 300-ton storage bunker is to be erected on the boiler room

roof, and fuei from the cars is to be elevated by a locomotive crane provided with a 50-ft. boom and clam-shell grab bucket, which will travel on one of the tracks. The fuel will pass from the bunker down a chute into a crusher, and then into a hopper which will travel on a track over the stokers discharging into them. This hopper will be equipped with scales for weighing the fuel. The ash pits below the stoker will be equipped with sheet-iron baskets, and these will run forward to the outside of the building, and will be lifted out by the crane and dumped in the car. The locomotive crane will also be available for use in handling material about the yard and for wrecking purposes, thus making it a very valuable accessory.

The company is now mining its own coal, having bought 600 acres of coal lands, producing first-class steam coal at a point on its tracks near Midvale. It has a small direct-current power station at this point, and the fuel runs directly from the mine into the power station. The company employs its own miners, and the coal costs less than $1.00 delivered in its own cars at Canton, a haul of 37 miles. The fuel is hauled at night and a special combination locomotive, work car and coal car has been built for this purpose. The car is 50 ft. long, has a small cab in the center and is equipped with four 75-hp motors and G. E. type M. train control, the entire controlling apparatus being mounted in the cab. The car has removable sides and has the capacity for handling 35 tons of fuel. Two 45-ft. coal cars are being built, and these will be handled by the locomotive.

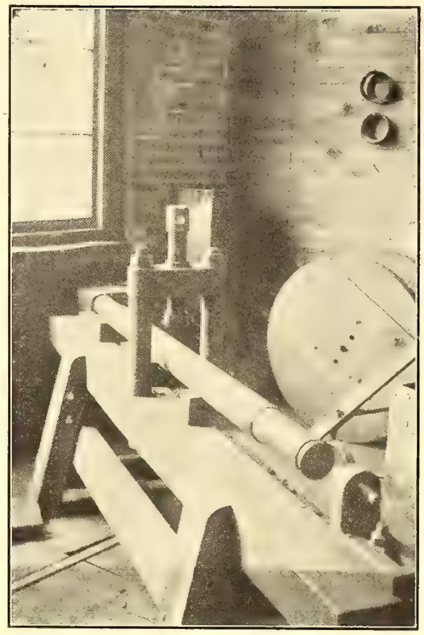
Several improvements have been made in the company's repair shops. A new building, 50 ft. x 100 ft., built of sheet iron, has been erected at the rear of the repair shops; this is divided in the center, and one room is used as a paint shop and the other as a woodworking shop, taking these classes of work out of the main shop. The woodworking shop is equipped with several valuable woodworking tools. A small portion of this room is divided off for a blacksmith shop, which is also equipped for making babbitt bearings. In the machine shop, which is in a separate room from the main repair shop, there has recently been installed a Putnam Machine Company's 42-in. boring mill, which is very valuable in wheel work.



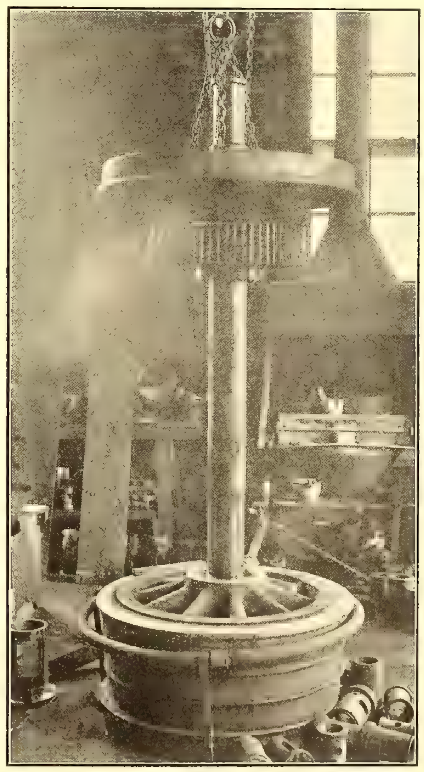
HOME-MADE COIL BAKING OVEN

A gasoline outfit for shrinking on steel-tire wheels shown in the accompanying illustration has recently been installed. The company does all its own armature and coil work, and a baking oven for baking varnish and insulation has been rigged up. It consists of a sheet metal box, the walls of which are double, with a heavy layer of asbestos between. The oven is heated by 12 rows of Simplex heaters. Another new device is an outfit for straightening axles and shafts. It consists of a heavy iron bed, with adjustable wedges and centering points and a powerful screw.

About $50,000 of improvements were made this season at Meyers Lake, which is owned and operated by the company. The resort is 2 miles from Canton, with a double-track spur line running to it, and embraces 160 acres of grounds bordering on a pretty lake about half a mile long by a quarter of a mile wide. The improvements include the erection of a fine theater building, an arcade for refreshments and penny amusement devices, a large roller rink, a boat house, a laughing gallery, electrical fountains and a pike, along which are a number of minor attractions such as a shooting gallery, cane racks, bowling alley, etc. The entrance has been improved by the erection of large shelter houses, and there is a covered walk leading from the entrance to the theater building protecting patrons in case of rainy weather. The park has a fine summer hotel, having 20 rooms and a large dining room. A number of steel row boats have been installed and two gasoline launches make trips across the lake to the Country Club, a beautifully situated resort, which is leased by the company to a private club.



VISE FOR STRAIGHTENING AXLES



DEVICE FOR SHRINKING ON STEEL-TIRED WHEELS

The theater building is one of the finest summer theaters ever erected near a city the size of Canton. It cost $20,000, exclusive of scenery, which is most elaborate. It has opera seats for 1500 people, and a stage large enough to accommodate any of the large grand opera companies now on the road. It is provided with the latest electrical appliances and effects. The building is of the Colonial type of architecture, and entrance to the theater is through three large doors opening from a large porch. Over these doors and to the right and left are two columns decorated with scroll work representing

various figures prominent in the theatrical world. There is also a massive cornice over the entrance doors, and over this cornice there are five large windows with circle arch tops,

THE NEW THEATER AT MYERS LAKE

and another cornice. This breaks the view of the gable, which stands 50 ft. high and is surmounted by a flagpole. The theater is well supplied with exits, to enable everyone to get out of the building within less than two minutes. There are two large property rooms and eight dressing rooms, making the playhouse exceedingly attractive to theatrical people, whose comforts are seldom looked after in a summer theater. The stage is 35 ft. x 75 ft., and is set off by an arch 40 ft. wide and 30 ft. high. To the right and left of the stage are twelve large fluted columns, giving the stage an artistic and pleasing effect. The interior of the building is richly decorated.

The floor rises 6 ft. from the stage to the rear of the house, which is at sufficient elevation to give an unobstructed view of the stage from any seat in the house. The scenery, consisting of two fine interior scenes, two exterior scenes, a drop curtain, a street curtain, and an olio curtain, was painted by one of the best scene painters in the business at a cost of $2,000.

Two high-class vaudeville performances are given each afternoon and evening. The theater is on the Keith circuit, and many of the highest-priced attractions have been booked. The theater and park are under the management of L. B. Cool, a well-known theatrical man in that district. No liquor is sold on the grounds, as Mr. Cool aims to get the patronage of the best class of people in the vicinity. Thus far this season, in spite of unfavorable weather, the returns have been very satisfactory. Mr. Cool has quite a large force of assistants in maintaining and advertising the resort. There is an excursion agent who solicits excursions throughout the entire district within a radius of 75 miles of the park, a press agent and advertising agent who keeps the newspapers of the district supplied with reading notices and paid advertising, a bill poster, who covers a large district, and an assistant manager, who is in direct charge of the theater. In addition there are a chief of police, with five patrolmen; a bank, which is in constant attendance; theater employees, caretakers, etc. All of the amusements, except the theater, are let out on a percentage basis.

The park not only draws from Canton, being the only pleasure park in the vicinity of that city, but it derives good business from Massillon, and New Philadelphia to the south, Akron to the north, and Alliance to the west. The company caters to these towns in a systematic manner. On Wednesdays and Fridays there are special cars from Canal Dover and New Philadelphia running directly to the park and giving a 25 per cent reduction from regular rates, while on Tuesday and Thursday evenings there are similar excursions from Akron. From Massillon, six miles distant, there is a tripper running directly to the park every hour, afternoons and evenings, on which there is a round-trip rate of 15 cents. This is in addition to the regular hourly interurban cars which connect with city cars for the park. Two evenings a week the Stark Electric Railway gives an excursion from

ENTRANCE TO ROLLER COASTER AT MYERS LAKE

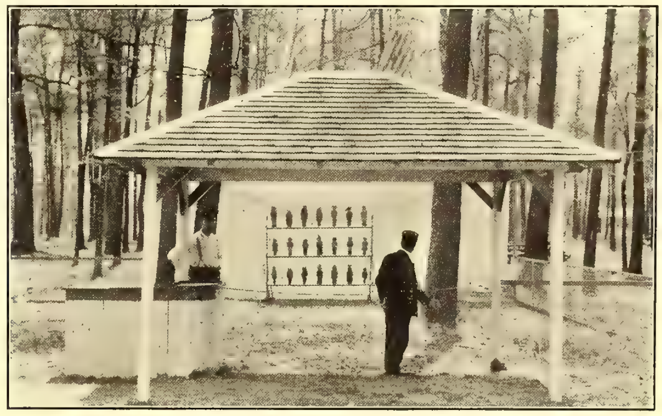
THE LAKEVIEW HOTEL, WITH DINING ROOM, GRILL ROOM AND BOWLING ALLEY

Alliance, the cars running directly to the park, and remaining until after the theater, giving a round-trip rate of 50 cents. There is a Canton city line running to the park on a 12-minute headway all day, and this is increased to 6 minutes in the evening and 3

minutes on Sundays and busy days. These cars run to the Public Square, where they connect with all city and interurban lines.

The park has a double system of illumination. There is one line running directly to the 500-volt direct-current bus-bar in the power station and a 13,000-volt high-tention line leading to a three-phase transformer, which reduces the current to 110 volts. The transformers and switching apparatus are contained in a small transformer station, and the lighting service is in charge of an electrician in constant attendance. The entrance to the park, several of the buildings, and the walks to the theater and along the lake have arches outlined with incandescents. These, together with 10 arc lamps, are taken off from the d. c. circuits, as is also power for a number of motors operating pumps at the hotel and various amusement attractions. The theater is illuminated with the alternating-current service, as are also about 1000 incandescents in various buildings and about the grounds. By this double arrangement the park is never likely to be entirely dark unless the entire power station shuts down.

THE SHOOTING GALLERY



PITCHING AT THE BABIES

THE LAUGHING GALLERY

The Canton-Akron system is in charge of J. R. Harrigan, general manager, who was formerly general manager for the Columbus, Buckeye Lake & Newark Traction Company, while the mechanical end is in the hands of W. E. Rolston, chief engineer and master mechanic, who formerly occupied a similar position with the Dayton & Troy Electric Railway. These gentlemen came with the company the first of the year, and they are responsible for many of the innovations which have lately been introduced.

HOLDING POWER OF RAILROAD SPIKES

The Forest Service of the United States Government has completed a series of tests to determine the holding power of different forms of railroad spikes. The tests were made on ordinary commercial ties of loblolly pine, oak, chestnut, and other woods. The spikes used were of four kinds: common driven spikes; a driven spike which has about the same form as the common spike with a lengthwise channel on the side away from the rail; screw spikes of the American type; and screw spikes similar to those in use on European railroads and differing from the American spike mainly in the manner of finishing the thread under the head.

The common and the channeled spikes were driven into the ties in the usual manner to a depth of 5 ins. A hole of the same diameter as the spike at the base of the thread was bored for the screw spikes, which were then screwed down to the same depth as the driven spikes. The ties were then placed in the testing machine and the force required to pull each spike was recorded.

The average force required to pull common spikes varies from 7000 lbs. in white oak to 3600 lbs. in loblolly pine, and 3000 lbs. in chestnut. The holding power of the channeled spike is somewhat greater. For example, about 11 per cent more force, or 4000 lbs., is required to pull it from the loblolly pine tree. The two forms of screw spike have about the same holding power, ranging from 13,000 lbs. in white oak to 9400 lbs. in chestnut, and 7700 lbs. in loblolly pine.

There is a marked difference between the behavior of driven and screwed spikes in knots and in clear wood. Knots are brittle and lack elasticity, so driven spikes do not hold as well in them as in clear wood. In the case of common spikes in loblolly pine the decrease of holding power in knots is as great as 25 per cent. On the other hand, screw spikes tend to pull out the whole knot which they penetrate. This increases the holding power in knots over that for clear wood.

OAKLAND TRACTION CLUB ROOMS IMPRESSED AS A HOSPITAL

Immediately after the earthquake and fire in San Francisco of April 18, all available halls and assembly rooms in that city, as well as in the neighboring cities about the bay, were converted into temporary hospitals for the injured and sick. In Oakland, through the generosity of the Oakland Traction

CORNER IN RECEPTION ROOM OF OAKLAND TRACTION CLUB, USED FOR INVALID WOMEN AND CHILDREN

Consolidated and the Oakland Traction Club, the club's handsome rooms were turned over to the relief committee and immediately arranged for hospital purposes. They were well adapted for such a use. With high ceilings, good ventilation, kitchen facilities and excellent lavatories, all the immediate necessities of a hospital were at hand. Here were taken old and young of both sexes, many of them injured in the stricken city, some of them overcome by shock and fatigue, and others confirmed invalids. Soon the rooms presented a far different aspect from that depicted in the description of the clubrooms in the STREET RAILWAY JOURNAL of March 17, 1906. The accompanying views show the gymnasium used for the injured and the reception room devoted to the invalid women and children. The cardroom and reading room were similarly used for patients, while the billiard room served as a supply and commissary depot, the billiard and pool tables being utilized, one for towels and bandages, another for disinfectants, and a third for medicines.

After having served for about two weeks as a general hospital, with as many as 150 cases at one time, it was changed to a maternity hospital on May 5. With a competent medical and nursing staff all cases were given the same attention as in a well-established hospital. A total of sixty-seven maternity cases were cared for, and over thirty babies were thus brought into the world under special obligation to the generosity of the Oakland Traction Consolidated.

On July 1 the few women who had not established homes of their own were transferred to other hospitals and the rooms were relinquished to the Oakland Traction Club.

During the period of over two months that the hospital was in possession the regular janitor service was maintained by the Traction Club, while the cost of supplies and the other running expenses were met by the Oakland relief committee and a committee of the Oakland Women's Club. The hospital was under the immediate direction of this committee, with Mrs. Wheeler as matron.

EFFECTIVE STREET RAILWAY ADVERTISING IN NEW ENGLAND

The Newton Street Railway Company, a description of whose advertising methods appeared in the STREET RAILWAY JOURNAL of Sept. 1, found it necessary on Friday, Aug. 31, to place an order for 50,000 of its four-color maps, only 15,000 remaining of the 50,000 printed Aug. 15. The company gives these away and finds that they are appreciated not only as a street railway map but as a map giving the details of the country around Boston. The company has recently received permission from the Boston Elevated to place a box 14 ins. long, divided into three compartments, upon each of its elevated stations and in each of these boxes are put the maps, "Our Country Rides by Trolley," and the booklet, "Routes of the Minute Men. To keep the boxes full it takes about 1500 "Trolley Rides," 2500 maps, and 2000 of the "Route of the Minute Men" every day. Investigation shows the pamphlets are taken by adults and after careful reading are kept for future reference. This year has been the most successful one in the history of Norumbega Park, and the company has been selling the house out, which means 3000 seats every night, by 7:30 at the least. At times all the reserved seats have been sold or reserved at 6 o'clock.

THE OAKLAND TRACTION CLUB'S GYMNASIUM AS A HOSPITAL FOR THE INJURED

Connecticut's first high-speed electric line, the Norwich & Westerly (R. I.) Railway, was opened for service Sunday, Sept. 9, the cars running as far as the Rhode Island State line.

PAPERS AND REPORTS AT THE MILAN CONVENTION

The International Street & Interurban Railway Association, which is known in France as the "Union Internationale de Tramways et de Chemins de Fer d'Interet Local" and in Germany as the "Internationaler Strassenbahn und Kleinbahn-Verein," and which includes among its members the principal street and interurban railway companies on the Continent of Europe, has been holding a convention at Milan this week. The meetings of this association occur every two years, and previous conventions for the last twelve years have been held as follows: In 1904 at Vienna, in 1902 at London, in 1900 at Paris, in 1898 at Geneva, in 1896 at Stockholm, and in 1894 at Cologne.

The list of papers to be presented at the meeting was published in this paper for Nov. 4, 1905, and the program of the social side of the convention, with the excursions, entertainments, etc., will be found in the STREET RAILWAY JOURNAL for Aug. 18, 1906, page 279. The Milan meeting is the fifteenth in the history of the association, and at the business meeting three members of the executive committee are to be elected to take the place of Messrs. L. Janssen, H. Geron and E. Lavalard, whose terms of office have expired and who are eligible for re-election. The meetings of the association are to be held in the concert hall of "l'Institut des Aveugles" in Milan, and are conducted both in French and German.

In view of the fact that the members of the association came from every country in Europe, an outline of the methods adopted for overcoming linguistic difficulties may be of interest. All of the papers, proceedings, etc., of the association are printed in both French and German, as at least one of these languages is spoken by the majority of those belonging to the organization. Any member who wishes to discuss any paper speaks in the language which he prefers and afterward, if he so desires, repeats what he has to say in the other language. If he is not sufficiently familiar with the other official language of the association to translate his own remarks, this is done by one of the officers of the association who can speak readily in either.

It is the practice of the association to issue in advance of the meeting not only the papers to be presented at the convention, but also the replies of the different members of the association to the questions sent to them by the committees or gentlemen appointed to read papers. These appointments are made a year or nine months in advance of the meeting, and each author prepares a series of questions varying in number from ten to fifty, relating to the topic upon which he is expected to address the convention. These questions are sent to the member companies about nine months before the meeting, and the replies are printed, bound and issued to the members from four to six months previous to the meeting. This volume for the Milan meeting comprises 650 pages and includes all the replies of the companies to the eleven questions to be considered. As in this way the members have before them the information upon which the author bases his paper, the author does not have to describe the practice of the different members on the points discussed in his paper, but summarizes the replies in the way which he considers would be most helpful to the members, and then offers his conclusions upon the subject under debate. Where the character of the subject warrants such treatment, these conclusions are so definitely stated that they can be considered as motions before the body and as representing its conclusions on the topic considered. The acceptance or modification of the conclusions of the author then forms the real subject for debate of the association.

A very common practice of the association is to appoint two speakers on any topic which is of especial interest and upon which there is a diversity of opinion. These two speakers offer separate reports which naturally differ in conclusions, and it is then the province of the association as a whole to select which set of resolutions best embodies its ideas, or else to frame new resolutions to suit the case. Thus, at the present meeting there were two papers on the subject of braking, with two sets of conclusions which differ materially from each other. There were also two papers of track construction and two papers on the desirability of sectionalizing the overhead line.

A number of the papers to be presented at the Milan meeting have reached this country, and digests of several of them appear in this issue. Others will be in early issues of this paper, and it is also hoped later in the year to present a report of the meeting. Although electric railway practice differs considerably on the Continent of Europe and in America, it is thought that many of the points brought out in the digests of the papers printed below will be of interest and practical application in this country. Many of the papers abstracted below are quite long, and in every case considerable portions have been omitted.

BRAKE SYSTEMS FOR ELECTRIC RAILWAYS

BY M. SCHOLTES,
Manager of the Nuremburg-Furth Tramways

At the Vienna meeting it was decided to continue the study of braking systems and that a committee be appointed to report further on the subject, especially in regard to the expense of installation and maintenance of the different systems, that a report be rendered on the results of a similar investigation conducted by the German Street Railway Association, and that a second paper should be presented by a partisan of air brakes. The writer was one of the committee which investigated this subject for the German association, and with Mr. Bjorkegren presented a report at Frankfort meeting in September, 1905. The present report embodies not only information secured from members of the International Association, but also those obtained while making this investigation for the German association.

In choosing a system of brakes, the first consideration is safety, and the second is expense, although the latter factor has an importance which ought not to be neglected. All railway companies recognize that the hand brake is not sufficient and that the equipment of a tramcar should include with the hand brake a power brake, that is, an electric or air brake, but opinions differ as to which of these two brakes is more desirable. The solution of this question has not, up to this time, been easy, because complete data on expense of maintenance have not been available. To-day, however, this condition no longer exists.

One hundred and forty-two companies, operating 14,563 cars, replied to the inquiries of this committee. In only twenty-nine of these cases had the installation of power brakes been required by the authorities, and then principally where trail cars were used. The following table shows the number and weight of cars and the braking systems employed by these 142 companies:

System of Braking.	Number and Weights of Cars.*									Number of Cars.		No. of Companies	
	From 5 to 6 Tons.	From 6 to 7 Tons.	From 7 to 8 Tons.	From 8 to 9 Tons.	From 9 to 10 Tons.	From 10 to 11 Tons.	From 11 to 12 Tons.	From 12 to 13 Tons.	From 13 to 16 Tons.	Total.	In Per Cent.	Total.	In Per Cent.
Hand brakes..	238	508	1639	1335	1095	14	22	154	7	5,012	34.4	71	50.0
Electric.......	16	436	924	2232	3086	100	204	234	34	7,266	50.0	60	42.2
Air brakes.....	0	21	286	426	216	326	71	704	235	2,285	15.6	11	7.8
										14,563	100.	142	100.

* All weights are given in metric tons.

As will be seen, the hand brake leads in number of companies, then the electric brake, and finally the air brake. It should be stated, however, that the hand brake is used principally on small roads running light cars. These companies declare the hand brake is amply sufficient for their purposes. As will be seen, many companies still use the hand brake for cars weighing more than twelve tons. Many of these companies even haul trail cars and have grades as high as 10 per cent. While the hand brake may be suitable for light traffic, its employment under conditions of the kind mentioned seems dangerous, because the physical strength required from the motorman to stop a heavy car with a hand brake under these conditions, is so great that it cannot fail to have an effect on the safety of the service.

About twenty-six companies complain that the electric brake is hard on the motors, that the gearing depreciates rapidly and that the controllers are injured. These complaints would indicate one thing only, that the electrical equipment of these cars is not suitable for electric braking. Many other companies speak very favorably of electric brakes, which tends to prove that when the electrical equipment is properly designed and selected for this service troubles of this kind disappear. Complaint is also made of the jerking character of electric braking, but this in turn is due to the fact that the resistances have not been properly selected.

Only twenty-six companies have made any tests on braking. This small number is undoubtedly due to the fact that tests on braking, to have any value, should be very carefully carried out. The results of the tests reported this year accord very closely with those obtained in 1900 by Mr. Poetz, manager of the Hamburg Railways, and confirm his conclusions that the electric brake is not surpassed by any other braking system in the rapidity of braking. On the other hand, the air brake is higher in first cost and maintenance and it wears out brake-shoes. All of these points confirm the opinion that the air brake is undesirable as a service brake. So far as energy is concerned, the results of tests at Berlin, Leipzig, Nuremberg, Hamburg and Paris indicate a consumption of 38 watt-hours per motor car kilometer for air brakes.

The accompanying table presents some figures on the amount of powei and cost required to compress air for the use of air brakes:

Companies.	Car-Kilometers Run in 1904.	Annual Expenditure for Compression of Air.	
		In Kw-Hours.	In Marks.
Berlin............	55,110,000	2,094,180	209,418
Leipzig........	12,622,000	1479,636	47,964
Hanover.......	9,045,000	343,710	34,371
Munich.........	8,330,000	316,540	31,654
Nuremberg-Furth	5,094,000	193,572	19,357
Crefeld..........	2,265,000	86,070	8,607

The following table gives an average of all of the figures received from the different companies replying to the list of questions relating to the initial cost and maintenance of the three braking systems:

Braking System.	Cost of First Installation.		Annual Maintenance Charges.	
	Per Motor Car.	Per Trail Car.	Per Motor Car.	Per Car Kilometer.
	Marks.	Marks.	Marks.	Marks.
Hand brakes................	Are included in cost of car.		87.00	0.20
Electric brakes..............	285.00	400.00	57.00	0.15
Air brakes..................	1164.00	212.00	188.00	0.30

To the maintenance of the air brakes should also be chargeable the expense of compressing the air and the extra expense due to the wear of brake-shoes and wheels.

When the electric brake is used as a service brake and not simply as an emergency brake, the equipment of the motor cars requires as the only additional expense the braking control cylinder. This cost, quoting again the average figures mentioned in the replies, is Mk. 285 ($71) per motor car. The installation of the electric brake on the trail cars costs an average of Mk. 400 ($100) per car. The replies indicate that some time ago trail cars were generally equipped with disc brakes, but recently the preference has been toward the solenoid brakes.

The figure, Mk. 1164 ($291), given as the cost of installation of the air brake, represents the average price demanded for old types and new types with different systems. For the old types the price was Mk. 1570 ($392); to-day it is about Mk. 1000 ($250) per car. The data on the price quoted for equipping the trail car with air brakes, Mk. 212 ($53), do not indicate whether this is for an automatic or straight air brake. In conclusion, the writer suggests that the association adopt the same conclusions which have already been presented to the German association, viz:

1. In the choice of a braking system all operating conditions should be taken into consideration. The retardation should be smooth. The equipment of the car should include two systems of brakes, each completely independent of the other. The service brakes should not tax the physical strength of the motorman.

2. When on account of the weight of the car, the operation of trail cars or the existence of very steep grades, the hand brake cannot desirably be employed as a service brake, a mechanical brake should be used, preferably an electric brake.

3. If the employment of an electric brake as a service brake should present inconveniences resulting, for example, from the use of too small a motor or unsuitable resistances or controllers, it is desirable to employ an air brake. The latter brake is indispensable when the cars are relatively heavy, and operate at high speeds or when the trains consist of three or more trail cars.

BRAKE SYSTEMS FOR ELECTRIC RAILWAYS

BY L. PETIT,

Division Engineer Societe Nationale des Chemins de fer Vicinaux, Brussels

The subject of braking systems was very fully discussed at the Vienna meeting of this association in 1904, as well as at the Frankfort meeting in 1905 of the German Street Railway Association. At the latter meeting two papers were presented on the subject, one by Mr. Scholtes of the Nuremberg Tramways and the other by Mr. Bjorkegren of the Berlin Tramways. A committee of two members was appointed by this association to report further upon the topic at this meeting, but they have reached different conclusions. One mem-

ber of the committee prefers electric brakes and the other air brakes.

One hundred and twenty-eight companies replied to the list of questions sent out by the committee. Many of these described their practice very carefully, but the conditions and opinions varied so greatly that the two members of the committee having this subject in charge have been unable to arrive at definite conclusions upon all points at issue. There is one point, however, upon which complete accord exists,—that it is indispensable to have an emergency brake when a hand brake is used. Ability to reverse the motors can be considered as supplying the requirement for the emergency brake, but reversing cannot take the place of a service brake. The committee is also agreed that any service brake ought not to require the expenditure of so much strength as to fatigue the motorman. Consequently on high-speed roads or where heavy cars are used, the ordinary hand brake is insufficient and air or electric brakes ought to be used. From this point the opinions of the members of the committee and of the member companies are divergent. We have not considered such special brakes as would be used on very steep grades, as they cannot be considered service brakes.

Electric brakes include short-circuiting brakes, reverse-current brakes, electro-magnetic, using either the disc or track shoe, and solenoid brakes. Air brakes can be divided into classes according to the method of compressing the air and whether they are automatic or use straight air. Thus, there are numerous kinds of each type of brake, and it is difficult on account of the varying first cost to establish an exact comparison. As, however, the electric brakes are as a class cheaper than the air brakes, the burden of proof as regards advantages is upon the latter.

It has been equally impossible to obtain any exact figures as to maintenance on account of the large number of elements involved. Thus, with the electric brakes it has been a question whether expense of maintenance of the motors, controllers and resistances should be included. Nevertheless, in general the advantage of maintenance is in favor of the electric brake with the reservation that while the maintenance of the air brake can be absolutely determined the same is not exactly true of the electric brake.

Twenty companies gave information as to the energy required in operating the air brake. The average is from 30 to 40 watt-hours per train-kilometer (50-65 watt-hours per train mile). On the other hand, it is estimated that 22 watt-hours (35 watt-hours per train-mile) is the energy required for the electro-magnetic brake. Munich, however, reports a total consumption of energy about the same when using hand brakes and air brakes, in fact a slightly lower consumption with air brakes. The line runs through crowded streets and has many grades, and the explanation is that with the slow-acting hand brake a motorman would apply his brake often, but that with the car under better control with air brakes he would not apply his brakes so frequently, and so would reduce the total current consumption. This experience, which will probably be the same on other lines, indicates that a braking system which would be undesirable for certain lines might on others possess great advantages. Even if the short-circuiting brake does not consume energy, it does require motors of larger power than would be employed with air brakes, hence the motors are less efficient in ordinary service and the consumption of energy is higher. It is a question whether this additional consumption of energy is not equivalent to that required to compress the air. No experiments have been made on this point.

The air brake has the advantage of being independent of the contact of the trolley wheel with the overhead wire, and moreover is more rapid in its action. It does not have to be supplemented by the hand brake to make a complete stop, like the electric brake. It requires less skill to make a good stop than the electric brake. The actual distance required to make a stop is practically the same with the two. Defects in the air brake are practically confined to leakages of air which are immediately manifest to the motorman by his air gage. Troubles with the electric brake can occur from a poor connection, which is not so easily detected. Automatic air brakes can be applied to trail cars and are of great advantage in case the coupling breaks on heavy grades. On the other hand, the electric brake is liable to burn-outs in case of overload. For this reason the air brake is more reliable than the electric, especially on systems with heavy grades. The writer agrees, therefore, with the conclusions of Mr. Bjorkegren expressed at the Frankfurt meeting of the German Street Railway Association, in which he preferred the air brake for lines with heavy grades where the trains consist of one or two train cars, also for all systems where heavy cars and high speeds are the rule.

There should be a more careful consideration of the advantages and disadvantages of the different types of air brakes and electric brakes, which the present author has not attempted in this paper. Moreover, there are a number of new mechanical brakes, particularly air brakes, which have not been in operation for a sufficient length of time to permit of a satisfactory verdict as to their value. For this reason the author recommends that the association should adopt the following conclusions:

1. In selecting a braking system, all operating conditions should be taken into consideration. The retardation should be smooth and the operation of the service brake should not tax the physical strength of the motorman. The service brake ought to be also suitable for employment as an emergency brake, and as such its action should be certain and rapid. The equipment of every car ought to include not only a service brake but an auxiliary brake.

2. When on account of the weight of the car, the operation of trail cars or the existence of very steep grades the hand brake cannot desirably be employed as a service brake, a mechanical brake should be used, either an electric brake or an air brake.

INTERURBAN TRACK CONSTRUCTION

BY C. DE BURLET,
General Manager Société Nationale des Chemins de fer Vicinaux, Bruxelles

This report is confined to a discussion of the proper length of rail, the use of welded joints, the maintenance of joints and methods for preventing the loosening of bolts. The reports from 138 companies show that—

Thirty-two companies use rails varying in length from 6 meters to 9 meters (19 ft. 8 ins. to 29 ft. 6 ins.).

Sixty-three companies use rails from 9½ meters to 12½ meters (31 ft. 2 ins. to 41 ft.).

Thirty-seven companies use rails varying in length from 14 meters to 15 meters (45 ft. 10 ins. to 49 ft. 2 ins.).

Six companies use rails 18 meters (59 ft. 3 ins.) in length.

One company, the Paris Eastern, is using rails 24 meters (78 ft. 9 ins.) long. The advantages of long rails are that they can be laid more rapidly, the number of joints is reduced and the riding is more easy. The principal difficulty seems to be inconvenience in handling in some cases. The company with which the author is connected owns 128 lines, having a total length of 2800 km (1736 miles) and including seven

electric lines with a total length of 140 km (87 miles). The standard rail has a length of 9 meters (29 ft. 6 ins.), but some rails 18 meters (59 ft. 3 ins.) in length have been used.

Welded joints will naturally be considered in a paper on city railway track construction which has been assigned to another committee, but the author has collected some particulars upon them. Three interurban companies seem to have used welded joints, two the Falk and one the Goldschmidt. A fourth has been using a substitute called the Ambert joint, in which the joints are held in place by a braced yoke which takes the place of angle plates and bolts. The companies using welded joints appear satisfied with them and consider that they add to the life of the track. Another type of welded joint was described by Mr. Catani before the Italian Electrotechnical Association in 1905, in which the rails are welded by the oxyacetylene blowpipe process, and which is claimed to be less expensive than and equally as durable as other welded joints. The cost of this joint on a 34.5-kg rail, 160 mm in height (79-lb. rail, 6 ins. in height), was 6 to 12 francs ($1.20 to $2.40).

Various types of lock washers are reported as in use, but none seems to have marked superiority compared with the others.

The conclusions of the writer are:

1. There is a tendency to increase the length of rails.

2. The experience with welded joints is not so positive as to warrant a definite conclusion.

3. General practice favors staggered joints on tangents and opposite joints in curves of short radius.

4. No one system of preventing the loosening of the bolts is so superior to the others as to warrant its exclusive endorsement.

TRACK CONSTRUCTION IN CITY STREETS

BY M. DUBS,
Manager of the Marseilles Tramways

The present tendency is to increase the speed of cars, not only because a better service is given passengers, but also because the platform expenses, fixed charges and many other items are relatively reduced. One of the great handicaps to high speeds is the attempt to run a frequent service upon a single track. Double tracks should be installed when the cars run on a headway as frequent as eight to ten minutes. Where the width of the street is not sufficient for a double track, a second track can be laid in a parallel street. Loops at the ends of lines are to be recommended, especially when trail cars are used. When the streets are narrow the tracks should be laid as near as possible to the middle of the street to avoid interference with vehicles standing at the curb. This has the objection that it makes access to the cars somewhat more difficult, but it can be overcome by placing "refuges" between the tracks. In Marseilles refuges are placed around the center double-bracket poles every 80 meters. The provisions in regard to clearances which form a part of every French tramway franchise, and which are fair and reasonable, are as follows:

Minimum distance between two vehicles passing each other at right angles ....50 cm or 20 ins.
Minimum distance between the outside of the car and the curb—
(a) When no standing traffic is to be provided for, 30 cm or 12 ins.
(b) When provision is made for standing vehicles, 260 cm or 8 ft. 5½ ins.
Which can be reduced under exceptional circumstances to..........................240 cm or 7 ft. 10½ ins.
Minimum distance between car and abutting property, 140 cm or 4 ft. 7 ins.
Minimum distance between the car and any single obstacle, such as a tree, pole or bridge abutment........75 cm or 29½ ins.

The desirability of widening the groove of rails in short-radius curves has been discussed to a considerable extent, and a paper on this subject has recently been published in the "Electrotechnische Zeitschrift." The author, Max Dietrich, of Stettin, recommends the dimensions given in the accompanying table upon the following basis:

Wheel base, 1.80 meters or 4 ft. 11 ins.
Diameter of wheels, 0.80 meters or 31½ ins.
Height of flange, 0.02 m or 0.8 ins.
Width of flange, 0.02 m or 0.8 ins.
Gage of wheels (inside) for a track of 1 m, 0.95 m or 37.6 ins.
Gage of wheels for standard gage of track, 1.385 m or 4 ft. 6½ ins.

RADIUS OF CURVE. (Interior Rail.)	One Meter Gage.			Normal Gage.		
	Gage.	Groove Interior.	Groove Exterior.	Gage.	Groove. Interior.	Groove Exterior.
	mm.	mm.	mm.	mm.	mm.	mm.
15 m........	1007	39	38	1441	39	38
20 m........	1004	35	35	1439	35	35
25 m........	1002	33	33	1437	33	33
30 m........	1001	32	31	1436	32	31
40 m........	1000	30	30	1435	30	30

A number of systems have adopted a width of groove of 35 mm (1.4 ins.) for curves having a radius of less than 40 m (121 ft.).

Concrete is usually employed as a foundation for track construction in England, Belgium and Germany, whereas most of the lines in France, Spain and Italy use ties on a broken stone ballast. Both methods give good results, but the writer is inclined to favor the more flexible construction on stone ballast, as he believes it will reduce the noise and vibration of the rails.

A number of new joints are being tried by different companies. Among these joints are Ambert, Arbel and Holzer. The Ambert joint consists of a yoke of cast or rolled steel

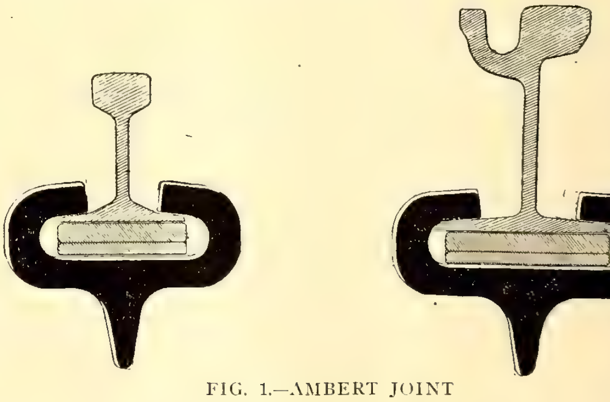


FIG. 1.—AMBERT JOINT

which has a thickness of 1 in. and is pressed around the base of the rail. Two base plates of the same size as the angle plates are used as shown in Fig. 1. No bolts are required. The Arbel joint (Fig. 2) also consists of a yoke, but the rail is held in the yoke by braces retained in position by four wedges. The Holzer joint (Fig. 3) is made by riveting on to the base of the rail a base plate which may consist of an old inverted rail. None of these joints has been in use long enough to determine its real value. The Falk joint has been used quite widely in France, and is considered one of the best, but has the drawback that it is expensive and requires a large equipment. The Goldschmidt joint has also been used to some extent and deserves the attention of railway com-

panies. Electrical welding by alternating or by direct current, the latter according to the system of the Accumulatoren Fabrik, has not been employed yet in France. A new system of welding by acetylene blowpipe has been used in Italy to some extent. The difficulty and expense of gaining access to the joint in paved streets makes a boltless joint extremely desirable.

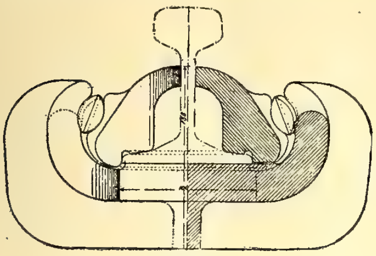


FIG. 2.—ARBEL JOINT

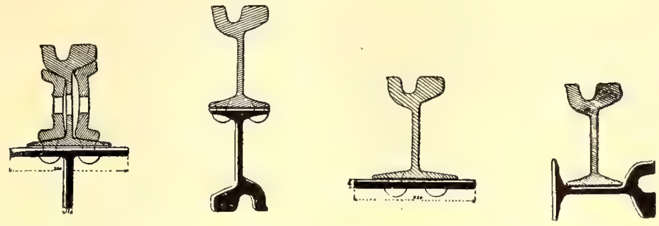


FIG. 3.—FORMS OF RIVETED JOINTS USED BY THE PARIS EASTERN

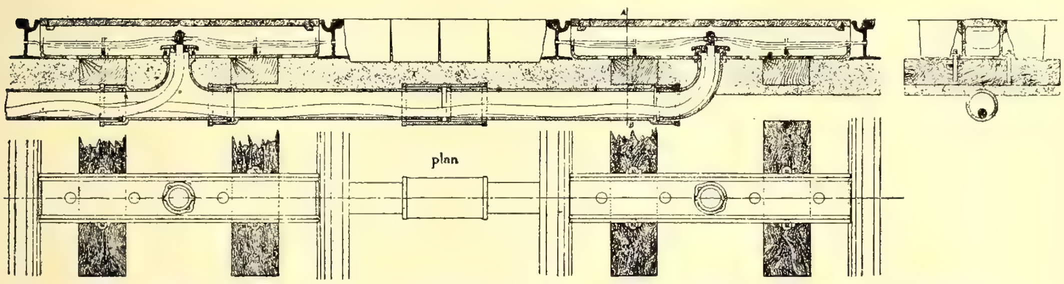


FIG. 4.—METHOD OF MAKING CONNECTIONS TO RETURN CONDUCTOR IN MARSEILLES

The general tendency in bonding is to use a short flexible copper bond with expanded terminals. In Marseilles especial attention is given to the connections between the cross-bonding and the return feeder. These return feeder taps are located in conduits passing under the rails, as shown in Fig. 4.

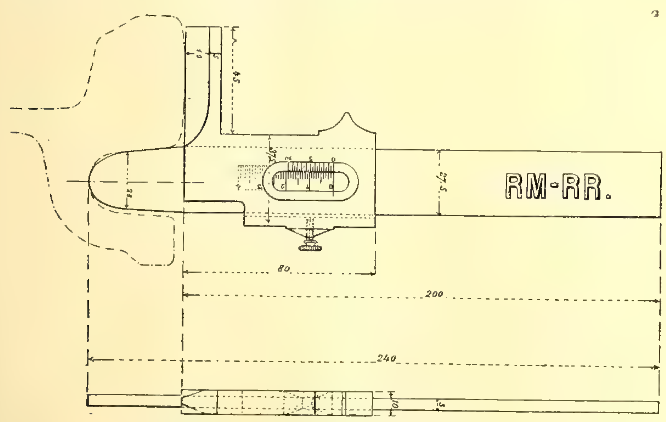


FIG. 5.—MICROMETER GAGE FOR MEASURING THE WEAR OF THE HEAD OF THE RAIL

Standard hardened steel manganese special work such as manufactured by the Lorain Steel Company, the Hadfield Steel Foundry and by the Cruesot and Krupp Steel Companies is in general use.

In most of the French franchises the railway company is obliged to keep in repair the portion of the street between the rails and tracks and on each side of the outer rails to a distance of 35 to 50 mm (14 to 20 ins.). While there is no legitimate reason for requiring the companies to maintain this pavement, it is an inheritance from the days of horse traction, and municipalities still insist upon this provision. The maintenance of this pavement is positively detrimental to the railway company outside of the expense entailed, because the result is that this portion of the street is always well paved and vehicles are attracted to it and obstruct the operation of the cars. The annual expense of maintaining this pavement varies from 2 francs to 2.5 francs per square meter (32 to 40 cents per square yard), and even more where the street traffic is large.

An ingenious form of micrometer gage for measuring the wear of the head of the rail is illustrated in Fig. 5.

There has been considerable speculation of late as to the cause of rail corrugation, and one of the questions sent out to the member-companies related to this phenomenon. In the opinion of the writer, rail corrugation is caused by vibration of the rail. If a car should run freely on the track there would be no tangential force between the periphery of the wheel and the rail, that is, there would be no tendency either to slip or skid. But it is otherwise as soon as any force is applied to the wheel, either positive in the direction in which the car is going, through the motor, or negative when the brake is applied. The adhesion between the wheels and the rails depends on the coefficient of friction and also on the weight upon the wheel. Assume now that the rail is vibrating rapidly. As the inertia of the car prevents it from following variations instantaneously, the pressure of the wheel on the rail and hence the adhesion of the wheel and rail at the point of contact undergo wide variations in proportion to the amplitude of the vibrations of the rail. As the tangential force at the point of contact, either positive or negative, remains constant, the result is a succession of slippings and in consequence a series of corrugations on the head of the rail. It has been shown that this kind of wear occurs rarely in tracks which are flexibly supported and consequently have less vibration.

WATTMETERS AND OTHER CURRENT RECORDERS FOR CARS

BY M. WATTMANN,
Manager of the Cologne Tramways

This subject was discussed by Mr. Klitzing, of Magdeburg, at the Vienna convention in 1904, but the tests at that time with devices other than wattmeters were so recent that it was difficult to formulate any definite conclusions. Since then a number of companies have adopted the current-time recorder instead of the wattmeter.

On a great many roads, especially those which have to purchase their current, the expense for power is an important item and in some cases is as high as 20 to 25 per cent of the entire cost of operation. It is generally admitted that the consumption of current depends in large part upon the skill of the motorman in manipulating the controller. It is a common sight to see careless motormen accelerate up to a certain point and then immediately apply the brakes, a condition which would soon be detected by the use of meters of some kind. The experience of different companies which have used meters show a reduction in current for the same service varying all the way from 4 to 20 per cent. In the

case of individual runs, in Cologne, the saving has been as high as 70 per cent. Magdeburg was the first company, so far as the writer knows, to install individual current meters on its cars. This was done in 1901, when a considerable number of the cars of that system were equipped. The results were so marked that a special bulletin of the International Association was issued on the subject.* The following table gives the names of the principal companies which have installed a considerable number of wattmeters or other recorders for measuring the current consumption on the cars. In addition a large number of other companies have installed meters on a few of their cars.

COMPANY.	Application of Meters Commenced in	Number of Motor Cars so Equipped.	Total Number of Motor Cars.
Berlin	1901	232	1664
Hamburg	1903	606	606
Barmen-Elberfeld	1903	66	66
Bremen	1905	131	131
Frankfurt	1905	241	241
Mulhausen	1905	19	19
Stuttgart	1905	23	133
Dusseldorf	1906	144	144
Hagen	1906	36	36
Dresden	(?)	99	162

Originally wattmeters were used for this purpose. Recently, however, many companies have adopted a time recorder, which consists of a simple clock movement which is stopped when the current is cut off. That is, it registers the hours during which the current is used. Several companies, among them those in Hamburg and Frankfurt, have experimented with a device which registers the revolutions of the wheels—that is, the distance run—with the current on; but this device did not give good results and is no longer in use.

The current-time recorder mentioned accomplishes only what its name implies, it registers simply the time the current is on, independently of the amount of current. Nevertheless it is much more rugged than the wattmeter, whose reliability seems to be affected by the vibration of the car. The result is that many companies have abandoned the wattmeter for this device. Berlin, which has been using for the last five years both Thomson-Houston wattmeters and Eibig current-time recorders, states that the latter after six months' operation maintain their accuracy within 1 to 2 per cent. Bremen has 131 of these recorders and Hamburg 600. Their great advantage lies in their simplicity, reduced maintenance and lower first cost. The average price of installing a car wattmeter varies from between 150 and 250 francs ($30 to $50), while the current recorder can be installed for about 50 francs ($10).

The advocates of the wattmeter claim, not without reason, that the object of measuring current is exclusively to secure economy in its use, and that the motorman will soon learn that with a current recorder the record is kept not in watt-hours but simply in hours during which the current is in use. The advocates of the current recorders, however, claim that there is practically a constant ratio between the time and the watts. Theoretically, it is evident that there is no such absolutely constant relation, because of the power required to accelerate after stops. On the other hand, a minimum consumption of current is also not the sole criterion. If it were, the proper way would be to pass over the notches of the controller rapidly and then coast as far as possible. This not only produces irregular acceleration but it is also bad for the motors. On the other hand, with the current-time recorder only, the motorman is tempted to throw the motors into parallel rapidly, although experience has not shown this to be the case. Under these circumstances we must recognize the fact already stated, that a minimum consumption of energy is not the sole criterion of skill in operation of the motorman. If, however, experience shows that the times during which the current is on are practically proportional to the consumption of the current, the use of the current-time recorder will undoubtedly result in an economy of energy equal to any system which directly measures the current. That this in fact is the case is shown in the three replies from the companies in Frankfurt, Dusseldorf and Hagen, which were able by the use of current-time recorders to obtain a notable decrease in the power consumption. It would be interesting if a car should be equipped with both devices and tested to see how closely the two registrations correspond. Some companies are opposed to any system of this kind, fearing that motormen who wish to make records will not comply with the schedule and that others also anxious to have a low current consumption will not pay sufficient attention to the security of pedestrians in the street.

The first cost of wattmeters has already been given. Their cost of maintenance per 100,000 car-kilometers (62,000 car-miles) varies between 3 marks (75 cents) in Dresden to 150 marks ($37.50) in Copenhagen. If we take only the companies which have had wattmeters in use for some time, the figures would be: Berlin, M. 17 ($4.25); Hamburg, M. 27.50 ($6.87); Magdeburg, M. 21.20 ($5.30). Wattmeters are calibrated twice a year in Dresden, every two months in Hamburg and every month in Magdeburg. The current recorders mentioned have not been in use long enough so that their maintenance cost can be accurately given. Frankfurt, which has had them in use for eight months, reports that they have been no expense and in any event the charge should be small.

The clerical work required in keeping readings given by the car meters varies among the different companies according to the extent to which these records are kept and applied, from M. 12 ($3) to M. 80 ($20) per 100,000 car-km (62,000 car-miles).

While the information obtained in the responses to the list of questions varies greatly, there is no doubt that the employment of meters of various kinds is increasing rapidly. The differences of opinion as to their actual and relative values, however, are so numerous that it would be desirable for those companies using meters of this kind to continue their trials and submit the statistical data thus secured to the association. In this way light may be thrown upon certain questions which at present are somewhat obscure.

* See STREET RAILWAY JOURNAL for May 2, 1903.

CONTINUOUS VS. SECTIONALIZED OVERHEAD SYSTEMS

BY PROF. G. RASCH,
Of the Polytechnic Institute, Aix-la-Chapelle

As a preliminary to a study of this topic it would be well to consider certain conditions so as better to define the peculiarities of each of the different systems of feeding. Suppose Fig. 1 represents a part of a system. The feeding-in points are indicated by small black circles, the trolley wires by light lines, and the section insulators by breaks in the light lines. If these light lines were continuous and there were no section insulators the system would be a continuous one. Besides the trolley wires shown, the feeding-in points are cross-connected by feeders, represented by the heavy lines in the engraving. These feeders may also be connected with switches so that they also may be cut out of circuit if desired. The section insulators can also be bridged by switches so that the line can be connected up solid or remain sectionalized. Assume first

that these switches are closed. Then every portion of the system could receive current by many taps outside of the single feeder which supplies the section. This will reduce the loss on the system and the advantages of the closed system then consists in more or less economy of power. Another advantage is that there is a more uniform voltage in the closed than in the open system. This will give more uniform lighting and less current in the motors.

Figs. 2 and 3 show two other diagrams which illustrate clearly the economy of the closed system. In Fig. 2, suppose

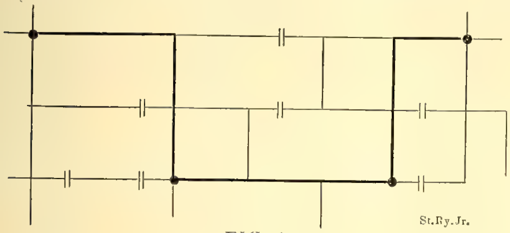


FIG. 1

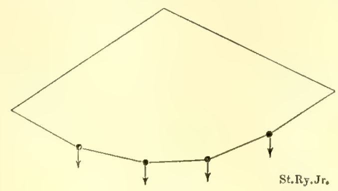


FIG. 2

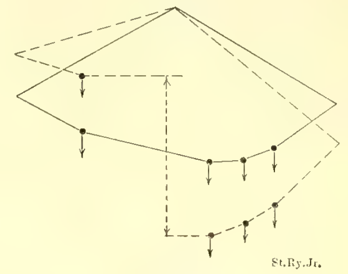


FIG. 3

there are four cars on the line, spaced equally along the line and each taking the same amount of current. In this case the drop in potential is indicated by the ordinates of the line and it is immaterial whether the closed or open system is used. Compare this, however, with Fig. 3, which shows the same system with the cars spaced unevenly. Here the distribution of voltage with the closed system is shown by the solid line and for the open system by the dotted line. It is hardly necessary to comment on this diagram. Let us now consider Fig. 4, in which the three points *a*, *b*, *c* are supplied with current and the trolley *A-D* is broken into sections which can be connected by the switches *B* and *C*. The feeders are supplied with circuit breakers F_1, F_2, F_3 and the generators by the circuit breaker *M*. Suppose first that *B* and *C* are open, making an open system, that the feeder breakers open with a current amounting to 60 and that the generator breaker opens with a current of 100. Assume then a short circuit amounting to 100 on the line feeding *b*. This will affect only feeder *b*, since the circuit breaker F_2 will open before circuit breaker *M*. If, however, *B* and *C* are closed, current 100 will divide

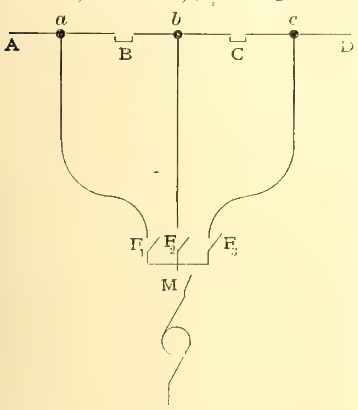


FIG. 4

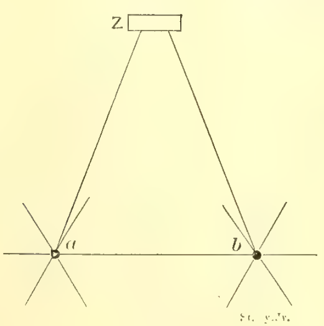


FIG. 5

itself between the three feeders, say in the proportion of 40 for feeder *b* and 30 for each of the feeders *a* and *c*. Then the main breaker will open and the entire system will be without current. For this reason advocates of the open system claim that an interruption of a single feeder will affect the entire line. On the other hand, the feeder breakers will open more frequently than in the closed system. Suppose for example that the short circuit has a value of 80 in place of 100. In this case none of the breakers will open, but if it were an open system the breakers on feeder *b* would open. According to one company, the advantage of localizing shorts is over-rated, for many lines are dependent upon each other for reasons outside the supply current. For instance, if there is an interruption of current on trolley section *b* and the cars stop, the cars on sections *a* and *c* will be blockaded, so that in many cases no great advantage is gained in localizing the faults. On the other hand, the open system does have the great advantage of enabling the management to tell promptly on which section the trouble lies.

Among the closed systems we can differentiate between those in which the section switches are operated by hand and those in which automatic breakers or fuses are used to bridge the sections. The former method is used principally on the shorter lines. Two only of the large systems use the hand switches, viz: the Amsterdam Tramways, which is now proposing to change part of its hand switches to automatics, and the Paris Eastern Tramway, which is very strongly in favor of hand switches. One company claims that automatic breakers at section insulators are not satisfactory because it is difficult to know whether they are open or not. The answer to this is that if the automatic breakers at section switches in a closed system are open, the company will be no worse off than if it were operating the open system.

To determine the value of the method of bridging feeding in points, already mentioned, let us take a theoretical case. Suppose section *a-b* in Fig. 5 is supplied with two feeders from power station *Z*, and that the resistance of each feeder is 2½ times that of the conductor between *a* and *b*. If the current furnished at each feeding-in point remains the same no advantage is gained by using two feeders. This condition, however, will rarely occur. An effort may be made to keep the voltage constant at all points of the system, but the size of the feeders has to be calculated from the average load,

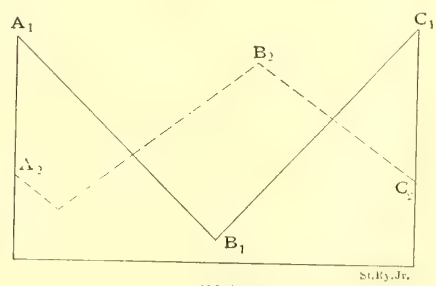


FIG. 6

and under the conditions arising from the operation of cars the voltage must vary. The ordinates of the full line A_1 B_1 C_1 in Fig. 6 represent the amount of current fed in at the point *a* at different moments in an assumed case. Suppose the current at the point *b* during the same periods is shown by the dotted line A_2 B_2 C_2. The economy of energy in the closed circuit as compared with the open circuit would then be 10.3 per cent, the average current being the same at the two points. In Fig. 7 the position of A_2 B_2 C_2 has been preserved, all the ordinates of the line *A*1 *B*1 *C*1 have been increased by the same amount. Here the average current at the point *a* would then be 40 per cent higher and the

economy would be increased in this case 11.1 per cent.

In the writer's opinion, an overhead system ought to be installed as follows: First, the greatest amount of copper should be put in the feeders and the least amount in the trolley wires. Then, sectionalize the trolley wires so as to limit the zone of distribution of each of the feeding-in points and render them possible of complete isolation from the neighboring sections. Finally, cross connect the different sections through automatic circuit breakers so as to join the termini of the feeders at from three to five neighboring points. If possible unite the ends of those feeders which will not be loaded at the same moment. This will give a system least subject to fluctuations. Thus, suppose Fig. 8 shows a portion of a tramway system. The feed-in points *a, b, c, d* are completely insulated from neighboring sections but are cross connected to each other by the heavy lines shown in the engraving, in which are the circuit breakers *A, B, C* and *D*. Fig. 9 shows schematically these same feed-in points, the conductors which connect them and the feeders which supply them with current. The other portions of the system have been left out in this diagram. Suppose the resistance of a trolley wire, for instance *a-b*, equals 0.29 ohms and that of the rails for the return of the current equals 0.06 ohms, that each of the feeders has a resistance of 0.5 ohms and that the average supply at each feeding-in point is 100 amps. Then in case of an accident to any one feeder each of the others would have to carry 137 amps. and each trolley wire forming the sides of the square ought to be calculated for a minimum of 50 amps.

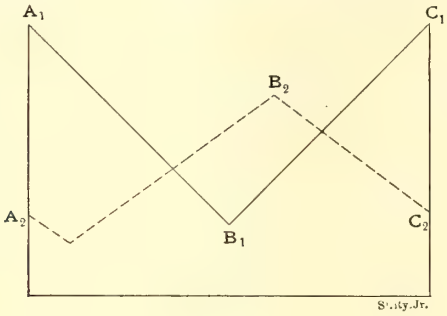


FIG. 7

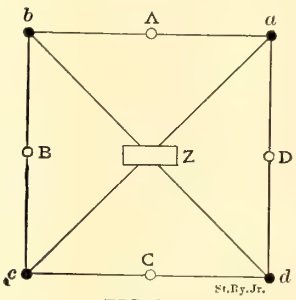


FIG. 9

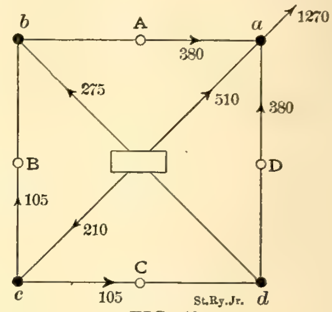


FIG. 10

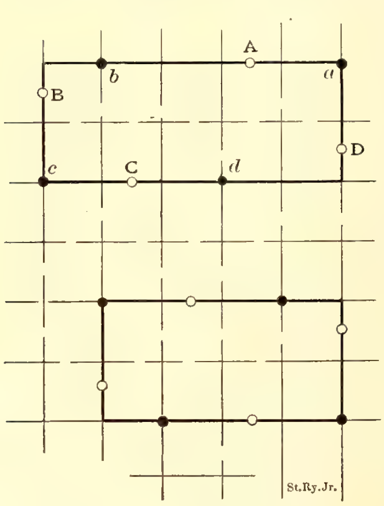


FIG. 8

The setting of the circuit breakers should depend on the amount of current resulting from a short circuit. If we suppose that in such case the voltage of the power station drops to 400 volts, say from a short circuit on line *a*, producing a short circuit of 1270 amps, Fig. 10, then the breakers of feeder *a* at the power station, and at *A* and *D* on the line, ought to open. That is, (1) the circuit breakers at the feeders ought to be able to carry 275 amps. but ought to open at 510 amps., and (2) the automatic circuit breakers *A, B, C* and *D* ought to carry 105 amps., but ought to open at 380 amps. As will be seen, these limits present variation sufficient to permit easy regulation.

It is possible to figure out other limits by a simple method. Suppose, for instance, we should insert just in front of each of the four line breakers *A, B, C* and *D* a resistance, equal to the resistance of the trolley wire, in this case 0.29 ohms. On account of these resistances the current from the short circuit on feeder *a* falls to 1080 amps. These 1080 amps. are distributed between the four feeding-in points as follows:

Point *a*	550 amps.
Point *b*	205 amps.
Point *c*	120 amps.
Point *d*	205 amps.

and between the four trolley wires as follows:

b-a	215 amps.
d-a	265 amps.
c-b	60 amps.
c-d	60 amps.

As will be seen, the limits 205 and 550 amps. for the feeder breakers and 50 and 265 amps. for the line breakers have just as wide a variation as in the preceding example. Moreover, the use of these resistances has an advantage from another point of view. Suppose that these resistances are not inserted and a short circuit occurs near the middle of the line *a-b*, or near the point *A*. Then the current would be divided nearly uniformly between the feeders *a* and *b* according to their size and resistance. If, however, the resistance was used the current would be largely confined to one feeder. That is, there would be an independence of the sections nearly equal to that obtained in an open system with the cöoperation between the feeders under normal load nearly equal to that in the closed system.

I might add that Prof. Blondel, of Paris, and the French Thomson-Houston Company recommend the connection of sections by means of automatic breakers, as outlined, though Prof. Blondel makes an exception of underground roads. The French Thomson-Houston Company recommends, in addition, the use in parallel with the breaker of five lamps which will indicate immediately by lighting up the opening of the breaker in case of a short circuit.

CONCLUSIONS OF MR. PIAZZOLI

Mr. Piazzoli, manager of the Silician Tramway Company, of Palermo, also brought in a report on this subject in which he gave preference to the sectional system. The saving in copper from the closed system does not, in his opinion, make up for its defects. Nevertheless he thinks that the breakers used for sectionalizing the line are by no means perfect, and suggests that experiments be conducted to determine their requirements and if possible to improve them.

STANDARDIZATION OF DIRECT-CURRENT TRACTION MOTORS

An important feature of the Milan meeting was a report presented on the standardization of direct-current traction motors by a committee consisting of Prof. G. Kapp, of the Birmingham University, ex-secretary of the Verband Deutscher Elektrotechniker; Prof. G. Rasch, of l'Ecole Polytechnique d'Aix-la-Chapelle; Prof. A. Blondel, of l'Ecole des Ponts et Chaussées, Paris; M. E. d'Hoop,

technical director of the "Les Tramways Bruxellois"; C. H. Macloskie, chief engineer of the Allgemeine Elektricitäts Gesellschaft; James Swinburne, ex-president of the British Institution of Electrical Engineers; and Prof. W. Wyssling, of the Polytechnicum, Zürich, and secretary of the Swiss Society of Electrical Engineers. Following is a translation of the report:

GENERAL

1. The following rules should be observed when machines are offered for sale, and when the sale is successfully completed, except where the seller and buyer, by mutual agreement, wish to modify them.

DEFINITIONS

2. Rating.—The mechanical power developed by a motor or simply the power of the motor, is that power which is developed at the motor axle, in accordance with conditions as given below.[1]

The continuous rating of a motor is that power which can be developed for ten consecutive hours without undue heating as prescribed in paragraph 6 on Heating; the current being supplied at normal voltage.

The normal rating of a motor is that power which would be developed for one hour without interruption and without undue heating, as prescribed in paragraph 6 on Heating; the current being supplied at normal voltage.

The maximum rating of a motor is that power which can be developed for five consecutive minutes without the least sparking at the brushes; the current being supplied at normal voltage.

3. Tractive Effort.—The tractive effort of a motor is the tangential force developed at the periphery of a wheel of specified diameter[2] for a given gear ratio. The conditions under which this force is developed are set forth in paragraphs on Acceptance.

4. Speed.—The speed of a motor is the peripheral speed of the car wheels produced when the chosen gear ratio is employed.

5. Efficiency.—The efficiency of a motor is the ratio between the mechanical power developed by the motor to the electrical power supplied to the motor terminals, the current being supplied at normal voltage.

6. Heating.—A motor is said to be overheated when, starting at an atmospheric temperature of 25 deg. C., it runs continuously for ten hours at its continuous rating or for one hour at its normal rating, and at the end of the specified period the temperature of the motor will have exceeded that of the surrounding air by the following amounts:

(a) Windings.
- Cotton insulated, 70 deg. C.
- Paper insulated, 80 deg. C.
- Mica insulated or other substances having the same insulating and heat-resisting qualities, 100 deg. C.

(b) Commutator, 80 deg. C.

(c) The cores in which are imbedded the windings should have temperatures corresponding to those given for the windings, according to the nature of the insulation. When the windings are insulated with combinations of the above given materials, the lowest temperature limit is taken.

SPECIFICATIONS

7. The specifications should contain, in addition to the normal voltage, the following data, all referred to the normal voltage:

1. The continuous rating of the motor and the corresponding value of the current.

2. The normal rating of the motor and the corresponding value of the current.

3. The maximum rating of the motor and the corresponding value of the current.

4. The efficiency when running respectively at the continuous rating and at the normal rating, the temperature of the motor being taken at 75 deg. C.

5. The character of the insulating materials.

6. The over-all dimensions of the motor; the gear ratio for a given diameter of wheel, tractive effort and speed both at the continuous and normal ratings must be given. Performance curves showing the tractive effort, the speed and the efficiency of the motor plotted with current value must also be given.[3]

NAME PLATE

8. In addition to the above data, contained in the specifications, each motor shall bear a plate giving the normal voltage, the normal rating, the speed and the corresponding current value.

CONSTRUCTION

9. The frame should be so constructed as to avoid magnetic leakage; it must be dust proof and also proof against water which might be thrown against it when in service. The frame must be fitted with openings which permit the maintenance of the brushes; said openings being hermetically closed. Maintenance of the brushes does not mean merely the renewal of the brushes, but also the renewal of the brush holders.

10. The bearings should be so constructed as to completely avoid the introduction of oil or grease into the interior of the motor.

11. The motor, and notably the commutator and the brushes, should be so constructed that the motor will run equally well in either direction without changing the position of the brushes. The sparking should be practically nil for all loads below the maximum rating.

12. The insulation of the windings from the cores and frame should be such that, immediately after the motor has attained its maximum allowable temperature, it will be able to resist for five minutes an alternating voltage the value of which is four times that of the normal voltage.

13. All parts of the motor which are liable to be replaced, in particular the armatures, field coils, the armature coils, the commutators, etc., should be interchangeable, i. e., these parts should be replaced without incurring the least work outside of mere readjustment; the removal of the armature should take place without disturbing the brush holders.

ACCEPTANCE TESTS

14. The acceptance tests shall be made before the motors are mounted on the cars. These tests consist not only in an examination into the general conditions of good manufacture and good construction, but especially in the determination of the power, the tractive effort, the speed, the efficiency and the heating.

(A) DETERMINATION OF THE MECHANICAL POWER

15. The mechanical power of a motor can be determined with an absorption dynamometer, which may be in the form of an electric generator coupled directly to the motor axle. The efficiency of the generator must be known for each con-

[1] In certain special cases it may be desirable to know the power of the motor itself exclusive of the gearing axles, etc. In this case, the word "propre" is added to each of the above-described methods of rating.

[2] In the case of direct-connected motors, the tractive effort will be that developed at the end of an arm 50 cm long, supposed to be mounted on the motor axle.

[3] In certain cases it may be desirable to know the heating and cooling curves of the motor when working at its normal rating and subsequently at other outputs; also those of the field coils and the armature coils when the motor is closed and at rest.

dition of load. The generator cannot be replaced by a traction motor similar to the one under test.

(B) MEASUREMENT OF TEMPERATURE RISE IN THE POWER TESTS OF MOTORS

16. The rating of a motor is determined, according to definition, by the temperature rise.

17. It shall not be allowable to take away, open or modify the case, covers, etc., which should be left as they will be in actual operation. It shall also not be permitted to produce artificially the current of air which would be caused by the movement of the car.

18. The temperature of the surrounding air shall be measured in each existing current of air; if any predominant current does not make itself felt, the mean temperature of the air surrounding the motor should be measured at the height of the middle of that current, and in both cases at a distance of about one meter from the motor. The temperature of the surrounding air shall be taken at regular intervals during the last fifteen minutes of the test, and the mean of the readings shall be taken.

19. In case a thermometer is used to measure the temperature, an attempt must be made to get the best possible conduction of heat between the thermometer and the part of the motor the temperature of which is to be measured, for example, by the means of an envelope of paper or tin. To avoid the radiation of heat, the thermometer wells and the parts of which the temperature is to be measured should be covered with substances which are poor conductors of heat (waste or similar material). A thermometer shall not be read until the mercury has ceased to mount.

20. The temperature rise of all parts of the motor except the field coils shall be measured with thermometers. Where possible the temperature should be measured at those points where it is greatest.

21. The temperature of the field coils shall be determined by the resistance method. If the temperature coefficient of restivity of copper has not been determined it can be taken as 0.004.

(C) DETERMINATION OF THE EFFICIENCY OF MOTORS

22. In determining the efficiency of a motor alone or with its gears, the absorption dynamometer method can be employed; fastening the brake on the motor axle in the first case, and upon an auxiliary axle which will take the place of the car axle in the second case. It is also possible, by exercising proper care, to use methods purely electrical as outlined in the following paragraphs.

23. The combined efficiency of the motors and their gearing is to be determined by one of the two following methods[4]:

(A) Two motors to be tested are coupled together mechanically by an auxiliary axle carrying a gear similar to the one on the car axle and engaging with the pinions of the motors. One of the motors should have the normal voltage E impressed across its terminals and running as a motor will consume a power equal to E I corresponding to the normal rating of the motor; the other motor will act as a generator and will deliver a power equal to E I′. The power supplied and the power delivered being measured, the efficiency of one motor and its transmission will be

$$\eta = \sqrt{\frac{E\,I'}{E\,I}}$$

As a check it is advisable to measure the power E i absorbed by the system:

$$E\,i = E\,I - E\,I' = I - I'$$

(B) Two motors to be tested are coupled together mechanically by an auxiliary axle carrying a gear similar to the one on the car axle and engaging with the pinions of the motors. One of the motors should run as a motor and the other as a generator; they should be inter-connected electrically so that the only power (PP) taken from the external source will be that required to supply the losses. If the total power furnished to one motor is P, and the total power delivered by the other as generator is P_2, then $P = P_1 - P_2$, and the efficiency of one motor with its gearing is

$$\eta = \sqrt{\frac{P_2}{P_1}}$$

The quantities P_1 and P_2 should be measured directly and electrically. As a check it is advisable to measure the power P furnished the system to supply the losses.

24. In case it is desired to find the efficiency of motor intended to be coupled directly to the car axle, the above methods can be applied by coupling the motors directly together.

[4] The methods described above are not theoretically exact, because of the differences in the methods of connecting the two parts of the system; the error, however, remains within the permissible limits as long as the gear ratio is small.

NEW STREET ANNUNCIATOR

The Indianapolis Traction & Terminal Company, of Indianapolis, has equipped one of its cars with a sample of the Livergood automatic street register and advertising indicator. The device is being placed on the market by the American Advertising Indicator Company, of St. Joseph, Mo., the patents having recently been purchased by that company from G. R. Livergood, the inventor. The indicator is a device about the size of a cash register, and is placed over the front door of the car. It may be operated by electricity, compressed air or steam, and automatically announces streets, stops, stations, points of transfer, hotels or places of interest as they are approached. The device requires no change in the equipment of a car or line beyond the attachment of a spur on the trolley wire. The machine has a capacity of 250 plates which, in connection with or between street announcements, afford space for advertising. The advertising capacity of each machine is said to be ten times the present available space in cars, and has the advantage of being front-end advertising. It is claimed that the indicator is compact, accurate and unobjectionable in appearance and requires no manipulation or attention by employees. It is stated that several Ohio and Indiana roads are about to make experiments with the device. A test machine was used for nine months on a St. Joseph, Mo., car to demonstrate that it is an accurate and practical device and a great convenience to the public, besides being a source of revenue to the company from an advertising standpoint.

The new clubhouse of the employees of the Jacksonville Electric Company, of Jacksonville, Fla., on Riverside Avenue, that city, has been formally opened. It is roomy, with large piazza upstairs and down, on the front and sides. To the right of the entrance is a large sitting room, with comfortable chairs, a table of magazines, chess and a big phonograph with numerous records. To the left of the entrance is the pool room, and back of this a well-arranged meeting room. The large dining room is on the right side of the hallway at the back. A room, perhaps 35 ft. square, well lighted and ventilated, containing four large dining tables and with a seating capacity for forty-eight. Across from the dining room is a large lavatory. Back of this is a well-equipped and very busy kitchen, where the first meal for the day is cooked at 5 o'clock in the morning and the last served a little before midnight. Upstairs are ten good-sized bedrooms, each containing two iron beds and two chiffoniers, and each room the sole property of its occupants, each man having his own latch key and his name on the door. A bath room is fitted with tubs and shower baths.

BRIDGES FOR ELECTRIC RAILWAYS—II

By C. C. SCHNEIDER, Consulting Engineer

SPECIFICATIONS FOR STEEL SUPERSTRUCTURES

The specifications which form a part of this paper have been adopted by the author for his guidance in his own practice. They are divided into two principal parts: Part I. contains the information necessary for computation and designing, such as loads, unit strains and details of construction. Part II. covers the quality of material, the workmanship, the inspection and the erection. Part I. for the use in the office, by the designer, and Part II. for the use in the shop and field.

That the specifications may be better understood, the writer will explain why he adopted some of the important features on which opinions of engineers may differ and for which the reader may naturally want to know the reason.

Live Loads: In selecting the proper live load for which structures carrying electric railways should be designed, not only the immediate needs, but also the probable future developments should be considered. Most of the earlier electric railways have committed the same error as the steam railroads in making no provision in their structures for future increase of loading produced by the necessity of using larger and heavier cars to accommodate the increasing traffic or providing for passenger traffic only, when it is quite probable that in the near future it may be desired to haul freight over the line. The probable future increase in the weight of rolling stock, as well as the probability of change in the traffic, should be anticipated in designing bridges which are intended to carry any kind of railway traffic. As the different kinds of cars in operation on the many electric railways now in existence vary so much regarding size, weight and wheel spacing, from the light four-wheeled conveyance in use on strictly rural lines to the heaviest train of motor cars run over the elevated railroads in our great cities, or a train of coal cars, it is impossible to select a certain kind of car as a typical loading to represent the maximum effects produced by every one of the different cars which are likely to run over a structure, even on a line limited to a particular kind of traffic. The author has collected diagrams of almost every kind of electric cars, freight cars and motors, and has grouped them into three different classes. By drawing moment and shear diagrams he has been able to select typical loads which, while they do not exactly correspond to any particular car in use as regards loads and wheel spacing, will give results somewhat in excess of the effects produced by any or a combination of the heaviest cars in existence used for a certain line of traffic, and also provide for probable future contingencies. To facilitate the selection of the proper loading for which structures should be designed, the loads have been classified in the specifications under three different heads, viz:

Class "A" loading: This represents the heaviest loading to which an electric railway bridge will probably ever be subjected, and should be used for freight lines or interurban railways connecting with steam railroads, or other lines on which freight traffic may be expected in the future. Bridges designed for this loading, approaching that of a steam railroad, will be strong enough to carry the heaviest coal trains hauled by electric locomotives.

Class "B" loading: This loading is adapted for elevated railroad traffic in large cities, such as occurs on the lines of the Interborough Rapid Transit and elevated railroad lines in New York City. City and suburban bridges in thickly populated districts where heavy passenger but no freight traffic is expected should be designed for this loading.

Class "C" loading: This is the minimum loading which should be allowed on any structure carrying electric railways, even for the lightest traffic in rural or thinly populated districts. A bridge designed for this loading will carry an ordinary contractors' construction train, consisting of a small locomotive weighing 16 tons on two pairs of drivers, hauling a train of short dump cars. Any bridge is liable to be loaded with a train of this kind during the construction of the road.

Many suburban lines originally intended for light passenger traffic only are now also carrying light freight such as is usually carried by express companies. This kind of traffic should therefore be anticipated in all cases, as it is likely to come sooner or later, and is provided for in Class "C" loading.

Impact or dynamic effect of the live load: To provide for the dynamic effect of the live load, caused by the irregularity of the track, flat wheels, swaying motion of the cars, etc., the writer has adopted the impact formula which he has used for steam railroad bridges for the last fifteen years in a modified form, to suit the conditions existing on electric railways. While this formula has been amply verified on steam railroads and found to be invariably on the side of safety, we have no data for electric railways. We know that the dynamic effect produced by electric cars and electric locomotives is considerably less than that produced by a steam locomotive, as the rotating motion of the driving wheel of an electric motor does not produce the same pounding effect on the rails as the reciprocating motion of the connecting rod in connection with more or less unbalanced driving wheels. Owing to the absence of any data, the writer has assumed the dynamic effect of electric motors to be one-half of that produced by steam locomotives, to be verified or corrected by later experiments.

Lateral load: The lateral load is not considered as consisting of the wind force only, but the function of the lateral system, besides resisting the wind force, is to prevent excessive lateral vibrations. For this reason the lateral force on the loaded chord is increased with the train load; that is, a bridge built for a heavier class of loading should have a heavier lateral system of the loaded chord, and for the same reason, viz: to prevent excessive lateral vibrations, the lateral system of the unloaded chord is specified to have the same section throughout, corresponding to that required for the end panels.

Centrifugal force: The formula for the centrifugal force is based on a varying speed of the train, the speed decreasing as the degree of curvature increases. The speed of train, which corresponds to centrifugal force given by the formula, is the maximum speed considered to be safe for any degree of curvature. Thus the centrifugal force for a 1-deg. curve corresponds to a speed of 59 miles per hour, and for a 12-deg. curve to 25 miles an hour.

Unit strains: The permissible unit strain of 16,000 lbs. per sq. in. specified for direct tension or compression, and the unit strains for shearing, bearing, bending and compression on columns corresponding therewith are those recommended by the committee on steel structures of the American Railway Engineering and Maintenance of Way Association as being in accordance with the best modern practice for railroad bridges, and are endorsed by a large number of the most eminent bridge engineers in this country and abroad.

Material and workmanship: That portion of the specifications relating to material and workmanship is practically the same as adopted by the American Railway Engineering and Maintenance of Way Association, as far as applicable to electric railway bridges and consistent with the views of the writer. The grade of steel specified, known as "structural steel," is also endorsed by the American Society for Testing Materials as the most reliable material for structures on the

strength and safety of which human life depends. It is, moreover, a commercial article which can be purchased from any reputable manufacturer without extra cost.

GENERAL INFORMATION TO BIDDERS

1. The railway company will furnish all information required to determine the span and general characteristics of the structure.

2. Bidders shall submit sealed proposals containing a price per pound for the steel work delivered at a specified location, or a price per pound for the structure erected, according to the requirements in the letter of invitation.

3. Immediately after the award of the contract, if the railway company does not furnish strain sheets or general drawings, they shall be prepared by the contractor, and in addition a complete set of shop drawings; blue prints of all drawings to be submitted to the railway company for approval.

4. Strain sheets shall show skeleton diagrams of all trusses, the dead and live load assumed, the strains from dead, live load and impact, area required and make up to section for all members of the bridge. The plus + sign shall be used to denote tension, and the minus — to denote compression.

5. Shop plans shall consist of the detail drawings of all parts of the structure, and shall include an erection diagram showing the marking and position of each member of the bridge.

6. After approval of the plans the contractor may commence work on the structure, and shall furnish the railway company with a requisite number of blue print copies of drawings for use during construction.

7. The drawings shall all be of a uniform size, 24 ins. x 36 ins. for shop drawings, and 18 ins. x 24 ins. or 12 ins. x 18 ins. for strain sheets, made on linen tracing cloth. One complete set of blue prints shall be deposited with the railway company before the material is shipped.

8. The contractor shall be solely responsible for the correctness of shop drawings, with regard to errors in fittings and lengths.

9. After plans have been approved, alterations will be permitted only upon written instructions from the railway company.

10. The time of completion of the contract shall be specified in the proposal, and the contractor will be held responsible for any delay beyond that date. He shall not sublet any part of the work to a sub-contractor, without the consent of the engineer of the railway company.

11. The contractor shall furnish all material and do all work to the full extent, spirit and meaning of the following specifications:

GENERAL SPECIFICATIONS FOR ELECTRIC RAILWAY BRIDGES

PART FIRST—DESIGN

GENERAL FEATURES

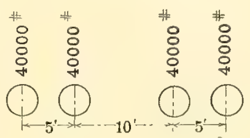
1. Classification—Bridges under these specifications are divided into three classes, viz.:
   Class A—For heavy electric railways carrying freight.
   Class B—For city traffic, including elevated railroads.
   Class C—For light suburban railways.
2. Kind of Material—The material in the superstructures, except as otherwise designated, shall be rolled steel.
3. Type of Bridges—The following types of bridges are recommended:
   For spans up to 20 ft.—Rolled beams or longitudinal trough floors.
   For spans from 20 to 100 ft.—Plate girders.
   For spans from 100 to 150 feet—Lattice girders.
   For spans over 150 ft.—Lattice girders or pin-connected trusses.
4. Clearance—In all through bridges the clear width from the center of track shall be not less than 7 ft. at a height exceeding 1 ft. 6 ins. above the top of rails where the tracks are straight. The width shall be increased to provide the same minimum clearance on curves, allowance being made for super-elevation of rails.
5. Head Room—The clear head room for all through bridges shall be not less than 15 ft. above the top of rail.
6. Spacing Trusses—The width center to center of trusses shall in no case be less than one-twentieth of the effective span.

Spacing of Stringers—Stringers shall be spaced generally not less than 6½-ft. centers, and in high viaducts not less than 8 ft.

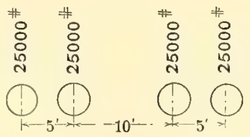
7. Skew Bridges—Ends of deck plate girders and track stringers of skew bridges at abutments shall be square to the track.
8. Ties—Wooden tie floors, where used, shall be proportioned to carry the maximum wheel load, with 50 per cent impact distributed over three ties; fiber strain on ties not to exceed 2000 lbs. per square inch, and the length to be not less than the total distance over the outer edge of supports plus 12 ins. They shall be not less than 7 ins. wide and spaced with not more than 6-in. openings, and shall be notched to a tight fit over supporting girders, depth of notch to be not more than 1½ ins.
9. Guard Timbers—Guard timbers shall be not less than 5 ins. x 8 ins., laid with the 8-in. face down, notched over each tie and securely fastened.

II. LOADS

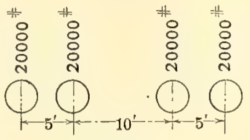
10. Dead Load—The dead load shall consist of the estimated weight of the entire suspended structure, assuming timber to weigh 4½ lbs. per foot B. M., and the rails and fastenings 100 lbs. per linear foot of track.
11. Moving Load—The moving load shall consist of one of the following classes:



CLASS A



CLASS B



CLASS C

Class A—On each track a series of concentrations, as shown, or a uniform load of 6000 lbs. per linear foot for all spans up to 50 ft., reduced to 4500 lbs. per linear foot for spans of 200 ft. and over; proportionately for intermediate spans, as per table below.

Class B—On each track a series of concentrations, as shown, or a uniform load of 3500 lbs. per linear foot for all spans up to 50 ft., a load of 2000 lbs. for spans of 200 ft. and over; proportionately for intermediate spans, as per table below.

Class C—On each track a series of concentrations, as shown, or a uniform load of 2500 lbs. per linear foot for all spans up to 50 ft., a load of 1500 lbs. for spans of 200 ft. and over; proportionately for intermediate spans, as per table below.

TABLE OF UNIFORM LIVE LOADS

CLASS A		CLASS B		CLASS C	
Span in Feet	Pounds per Lineal Foot of Each Track	Span in Feet	Pounds per Lineal Foot of Each Track	Span in Feet	Pounds per Lineal Foot of Each Track
50....	6,000	50....	3,500	50 ...	2,500
55....	5,950	55....	3,400	55....	2,450
60....	5,900	60....	3,300	60	2,400
65....	5,850	65....	3,200	65....	2,350
70....	5,800	70....	3,100	70....	2,300
75 ...	5,750	75....	3,000	75....	2,250
80....	5,700	80....	2,900	80 ...	2,200
85....	5,650	85 ...	2,800	85....	2,150
90....	5,600	90....	2,700	90....	2,100
95....	5,550	95....	2,600	95 ...	2,050
100....	5,500	100....	2,500	100....	2,000
110....	5,400	110....	2,450	110....	1,950
120....	5,300	120....	2,400	120....	1,900
130....	5,200	130....	2,350	130...	1,850
140....	5,100	140....	2,300	140....	1,800
150....	5,000	150....	2,250	150....	1,750
160....	4,900	160....	2,200	160....	1,700
170....	4,800	170....	2,150	170....	1,650
180....	4,700	180...	2,100	180....	1,600
190....	4,600	190....	2,050	190....	1,550
200....	4 500	200....	2,000	200....	1,500

12. Impact—The dynamic increment of the live load shall be added to the maximum computed live load strains, and shall be determined by the following formula:

$$I = S \frac{150}{L + 300}$$

Where

I = impact to be added to the live load strains.
S = computed maximum live load strain.
L = loaded length of track in feet producing the maximum strain in the member. For bridges carrying more than one track the aggregate length of all tracks producing the strain shall be used.

Impact shall not be added to strains produced by longitudinal, centrifugal and lateral or wind forces.

13. Lateral Load—All spans shall be designed for a lateral force on the loaded chord of 200 lbs. per linear foot, plus 10 per cent of the specified train load on one track, and 200 lbs. per linear foot of the unloaded chord; these forces being considered as moving. The laterals throughout the unloaded chord shall be of the same section required for the end panels.

14. Wind Load—Viaduct towers shall be designed for a force of 50 lbs. per square foot on one and one-half times the vertical projection of the structure unloaded; or 30 lbs. per square foot on the same surface, plus 400 lbs. per linear foot of structure applied 7 ft. above the rail for assumed wind load on trains when the structure is either fully loaded or loaded on either track with empty cars, assumed to weigh 1200 lbs. per linear foot, whichever gives the larger strain.

15. Longtudinal Force—Longitudinal bracing for viaduct towers and similar structures shall be designed for a longitudinal force, applied at the rail, of 20 per cent of the live load.

16. Centrifugal Force of Train—Structures located on curves shall be designed for the centrifugal force of the live load acting at the top of the rail. The centrifugal force shall be calculated by the following formula:

$$C = (0.043 - 0.003\ D)\ W\ D$$

C = centrifugal force in pounds.
W = weight of train in pounds.
D = degree of curvature.

III. UNIT STRAINS AND PROPORTION OF PARTS

17. Unit Strains—All parts of structure shall be so proportioned that the sum of the maximum strains shall not exceed the following amounts in pounds per square inch, except as modified in paragraphs 25 to 27:

18. Tension—Axial tension on net section............. 16,000

19. Compression--Axial compress'n on gross section, $16{,}000 - \dfrac{70\,l}{r}$

where "l" is the length of the member in inches and "r" is the least radius of gyration in inches.

20. Bending—Bending, on extreme fibers of rolled shapes, built sections and girders, net section............... 16,000
On extreme fibers of pins..................... 24,000

21. Shearing—Shearing, shop driven rivets.............. 12,000
Field driven rivets and turned bolts........... 10,000
Plate girder webs, gross section................ 10,000
Pins 12,000

22. Bearing—Bearing, shop driven rivets................ 24,000
Field driven rivets and turned bolts............ 20,000
Pins 24,000
Expansion rollers, per linear inch, 600 d, where "d" is the diameter of roller in inches.
Masonry 500

23. Limiting Length of Compression Members—No compression member shall have a length exceeding 100 times its least radius of gyration, excepting those for wind bracing, which may have a length not exceeding 120 times the least radius of gyration.

24. Alternate Strains—Members subject to alternate strains of tension and compression shall be proportioned for the strains giving the largest section. If the alternate strains occur in immediate succession (as in stiff counters), such members shall be so proportioned that their total sectional area is equal to the sum of areas required for each strain. The connections in either case shall be proportioned for the sum of the strains.

25. Counters—Wherever the live and dead load strains are of opposite character, only 70 per cent of the dead load strain shall be considered as effective in counteracting the live load strain.

26. Combined Strains—Members subject to the action of both axial and bending strains shall be proportioned so that the combined fiber strains will not exceed the allowed axial strain.

27. Lateral and other Strains Combined—For strains produced by lateral and wind forces combined with those from live loads, dead loads and centrifugal forces, the unit strains may be increased 25 per cent over those given above; but the section shall not be less than required if lateral and wind forces be neglected.

26. Net Section at Rivets—In proportioning tension members the diameter of the rivet holes shall be taken ⅛ in. larger than the nominal diameter of the rivet.

29. Rivets—In proportioning rivets the nominal diameter of the rivet shall be used.

30. Net Section at Pins—Pin-connected riveted tension members shall have a net section through the pin-hole at least 25 per cent in excess of the net section of the body of the member, and the net section back of the pin-hole, parallel with the axis of the member, shall be not less than the net section of the body of the member.

31. Proportioning Plate Girders—Plate girders shall be proportioned either by the moment of inertia of their net section, or by assuming that the flanges are concentrated in their centers of gravity, in which case one-eighth of the gross section of the web, if properly spliced, may be used as flange section. Assumed distance between centers of gravity of flanges should not be greater than distance over flange angles.

32. Compression Flange—The gross section of the compression flange shall not be less than the gross section of the tension flange; nor shall the strain per square inch in the compression flange of any beam or girder exceed $16{,}000 - 200\dfrac{l}{c}$ where "l" = unsupported distance and "c" = width of flange.

33. Flange Rivets—The flanges of plate girders shall be connected to the web with a sufficient number of rivets to transfer the total shear at any point in a distance equal to the depth of the girder at that point, combined with any load that is applied directly on the flange. The wheel loads where the ties rest on the flanges shall be assumed to be distributed over three ties.

34. Depth Ratios—Trusses shall preferably have a depth of not less than 1/10 of the span. Plate girders and rolled beams, used as girders, shall preferably have a depth of not less than 1/12 of the span. If shallower trusses, girders or beams are used, the section shall be increased so that the maximum deflection will not be greater than if the above limiting ratios had not been exceeded.

IV. DETAILS OF DESIGN

GENERAL REQUIREMENTS

35. Open Sections—Structures shall be so designed that all parts will be accessible for inspection, cleaning and painting.

36. Water Pockets—Pockets or depressions which would hold water shall have drain holes, or be filled with waterproof material.

37. Symmetrical Sections—Main members shall be so designed that the neutral axis will be as nearly as practicable in the center of section, and the neutral axis of intersecting main members of trusses shall meet at a common point.

38. Counters—Rigid counters are preferred; and where subject to reversal of strain shall preferably have riveted connection to the chord.

39. Strength of Connections—The strength of connections shall be sufficient to develop the full strength of the member, even though the computed strain is less, the kind of strain to which the member is subjected being considered.

40. Minimum Thickness—The minimum thickness of metal shall in main members be ⅜ in., in laterals, sway bracing and other unimportant members 5/16 in.

41. Pitch of Rivets—The minimum distance between centers of rivet holes shall be three diameters of the rivet; but the distance shall preferably be not less than 3 ins. for ⅞-in. rivets, and 2½ ins. for ¾-in. rivets. The maximum pitch in the line of strain for members composed of plates and shapes shall be 6 ins. For angles with two gage lines and rivets, staggered the maximum, shall be twice the above in each line. Where two or more plates are used in contact, rivets not more than 12 ins. apart in either direction shall be used to hold the plates well together. In tension members, composed of two angles in contact, a pitch of 12 ins. will be allowed for riveting the angles together.

42. Edge Distance—The minimum distance from the center of any rivet holes to a sheared edge shall be 1½ ins. for ⅞-in. rivets, and 1¼ ins. for ¾-in. rivets, and to a rolled edge 1¼ and 1⅛ ins., respectively. The maximum distance from any edge shall be eight times the thickness of the plate, but shall not exceed 6 ins.

43. Maximum Diameter—The diameter of the rivets in any angle carrying calculated strain shall not exceed one-quarter the width of the leg in which they are driven. In minor parts ⅞-in. rivets may be used in 3-in. angles, and ¾-in. rivets in 2½-in. angles.

44. Long Rivets—Rivets carrying calculated strain and whose grip

exceeds four diameters shall be increased in number at least 1 per cent for each additional 1/16 in. of grip.

45. Pitch at Ends—The pitch of rivets at the ends of built compression members shall not exceed four diameters of the rivets for a length equal to one and one-half times the maximum width of member.

46. Compression Members—In compression members the metal shall be concentrated as much as possible in webs and flanges. The thickness of each web shall be not less than one-thirtieth of the distance between its connections to the flanges. Cover plates shall have a thickness not less than one-fortieth of the distance between rivet lines.

47. Minimum Angles—Flanges of girders and built members without cover plates shall have a minimum thickness of one-twelfth the width of the outstanding leg.

48. Tie-Plates—The open sides of compression members shall be provided with lattice and shall have tie-plates as near each end as practicable. Tie-plates shall be provided at intermediate points where the lattice is interrupted. In main members the end tie-plates shall have a length not less than the distance between the lines of rivets connecting them to the flanges, and intermediate ones not less than one-half this distance. Their thickness shall not be less than one-fiftieth of the same distance.

49. Lattice—The minimum width of lattice bars shall be 2½ ins. for ⅞-in. rivets, 2¼ ins. for ¾-in. rivets, and 2 inches if ⅝-in. rivets are used. The thickness shall not be less than one-fortieth of the distance between end rivets for single lattice and one-sixtieth for double lattice. Shapes of equivalent strength may be used.

50. Rivets in Flanges—Five-eighths-inch rivets shall be used for latticing flanges less than 2½ ins. wide, and ¾-in. rivets for flanges from 2½ to 3½ ins. wide; ⅞-in. rivets shall be used in flanges 3½ ins. and over, and lattice bars with two rivets shall be used for flanges over 5 ins. wide.

51. Angle of Lattice—The inclination of lattice bars with the axis of the member shall be not less than 45 degs., and when the distance between rivet lines in the flanges is more than 15 ins., if single rivet bar is used, the lattice shall be double and riveted at the intersection.

52. Spacing of Lattice.—Lattice bars shall be so spaced that the portion of the flange included between their connection shall be as strong as the member as a whole.

53. Faced Joints—Abutting joints in compression members when faced for bearing shall be spliced on four sides sufficiently to hold the connecting members accurately in place. All other joints in riveted work, whether in tension or compression, shall be fully spliced.

54. Pin Plates—Pin holes shall be reinforced by plates where necessary, and at least one plate shall be as wide as the flanges will allow and be on the same side as the angles. They shall contain sufficient rivets to distribute their portion of the pin pressure to the full cross-section of the member.

55. Forked Ends—Forked ends on compression members will be permitted only where unavoidable; where used, a sufficient number of pin-plates shall be provided to make the jaws of twice the sectional area of the member. At least one of these plates shall extend to the far edge of the farthest tie-plate, and the balance not less than 6 ins. beyond the near edge of the same plate.

56. Pins—Pins shall be long enough to insure a full bearing of all the parts connected upon the turned body of the pin. They shall be secured by chambered nuts or be provided with washers if solid nuts are used. The screw ends shall be long enough to admit of burring the threads.

57. Filling Rings—Members packed on pins shall be held against lateral movement.

58. Bolts—Where members are connected by bolts the body of these bolts shall be long enough to extend through the metal. A washer at least ¼ in. thick shall be used under the nut. Bolts shall not be used in place of rivets except by special permission. Heads and nuts shall be hexagonal.

59. Indirect Splices—Where splice plates are not in direct contact with the parts which they connect, rivets shall be used on each side of the joint in excess of the number theoretically required, to the extent of one-third of the number for each intervening plate.

60. Fillers—Fillers between parts carrying strains shall be attached to the main member by independent rivets outside of the connection. The number of these rivets shall be at least 50 per cent of the number required in the connection.

61. Expansion—Provision for expansion to the extent of ⅛ in. for each 10 ft. shall be made for all bridge structures. Efficient means shall be provided to prevent excessive motion at any one point.

62. Expansion Bearings—Spans of 80 ft. and over resting on masonry shall have turned rollers or rockers at one end; and those of less length shall be arranged to slide on smooth surfaces.

63. Fixed Bearings—Movable bearings shall be designed to permit motion in one direction only. Fixed bearings shall be firmly anchored to the masonry.

64. Rollers—Expansion rollers shall be not less than 4 ins. in diameter. They shall be coupled with substantial side-bars, which shall be so arranged that the rollers can be readily cleaned.

65. Bolsters—Bolsters or shoes shall be so constructed that the load will be distributed over the entire bearing; spans of 80 ft. or over shall preferably have hinged bolsters at each end.

66. Wall Plates—Wall plates may be cast or built up, and shall be so designed as to distribute the load uniformly over the entire bearing. They shall be secured against displacement.

67. Anchorage—Anchor bolts for viaduct towers and similar structures shall be long enough to engage a mass of masonry the weight of which is at least one and one-half times the uplift.

68. Inclined Bearings—Bridges on an inclined grade without pin-shoes shall have the sole plate beveled so that the masonry and expansion surfaces may be level.

FLOOR SYSTEMS

69. Floor Beams—Floor beams shall preferably be square to the trusses or girders. They shall be riveted directly to the girders or trusses or may be placed on top of deck bridges.

70. Stringers—Stringers shall preferably be riveted to the webs of all intermediate floor beams by means of connection angles not less than ½ in. thick. Shelf angles or other supports provided to support the stringer during erection shall not be considered as carrying any of the reaction.

71. End Spacers for Stringers—Where end floor beams cannot be used, stringers resting on masonry shall have cross frames near their ends. These frames shall be riveted to girders or truss-shoe where practicable.

BRACING

72. Rigid Bracing—Lateral, longitudinal and transverse bracing in all structures shall be composed of rigid members.

73. Portals—Through truss spans shall have riveted portal braces rigidly connected to the end posts and top chords. They shall be as deep as the clearance will allow.

74. Transverse Bracing—Intermediate transverse frames shall be used at each panel of through spans, having vertical truss members where the clearance will permit.

75. End Bracing—Deck spans shall have transverse bracing at each end proportioned to carry the lateral load to the support.

76. Minimum Bracing—The minimum sized angle to be used in lateral bracing shall be 3 x 2½ x 5/16 ins. Not less than three rivets through the end of the angles shall be used at the connection.

77. Bracing to Clear Ties—Lateral bracing shall be far enough below the flange to clear the ties.

78 Tower Struts—The struts at the foot of viaduct towers shall be strong enough to slide the movable shoes when the track is unloaded.

PLATE GIRDERS

79. Top Flange Cover—Where flange plates are used, one cover plate of top flange shall extend the whole length of the girder.

80. Web Stiffeners—There shall be web stiffeners, generally in pairs, at ends and inner edges of bearing plates, and at all points of concentrated loading, and also at intermediate points wherever the unsupported depth of the web exceeds sixty times its thickness. They shall usually be spaced at intervals of about the depth of the girder, and in deck bridges shall not be more than 5 ft. apart. The stiffeners at ends and at points of concentrated loads shall be proportioned by the formula of paragraph 19, the effective length being assumed as one-half the depth of girders. End stiffeners and those under concentrated loads shall be on fillers and have their outstanding legs as wide as the flange angles will allow, and shall fit tightly against them. Intermediate stiffeners may be offset or on fillers, and their outstanding legs shall be not less than one-thirtieth of the depth of girder, plus 2 ins.

81. Stays for Top Flanges—Through plate girders shall have their top flanges stayed at each end of every floor beam, or in case of solid floors, at distances not exceeding 12 ft., by knee braces or gusset plates.

TRUSSES

82. Camber—Truss spans shall be given a camber by making the panel length of the top chords, or their horizontal projections, longer than the corresponding panels of the bottom chord in the proportion of ⅛ in. in 10 ft.
83. Rigid Members—The hip verticals and similar members, and generally the two end panels of bottom chords of single-track pin trusses up to 200 ft., shall be rigid.
84. Eye-Bars—The eye-bars composing a member shall be so arranged that adjacent bars shall not have their surfaces in contact; they shall be as nearly parallel to the axis of the truss as possible, the maximum inclination of any bar being limited to 1 in. in 16 ft.
85. Pony Trusses—Pony trusses shall be riveted structures, with double webbed chords, and shall have all web members latticed or otherwise effectually stiffened.

PART SECOND—MATERIALS AND WORKMANSHIP

V. MATERIAL

86. Process of Manufacture—Steel shall be made by the open-hearth process.
87. Schedule of Requirements—The chemical and physical properties shall conform to the following limits:

Elements Considered	Structural Steel	Rivet Steel	Steel Castings
Phosphorus, max. Basic....	0.04 per cent	0.04 per cent	0.05 per cent
Phosphorus, max. Acid ...	0.08 "	0.04 "	0.08 "
Sulphur, maximum.........	0.05 "	0.04 "	0.05 "
Ultimate tensile strength Pounds per square inch.....	Desired 60,000	Desired 50 000	Not less than 65,000
Elong. min. % in 8″ Fig. 1.	*1,500,000 / Ult. tens. stgth.	1,500,000 / Ult. tens. stgth.	
" " " 2″ Fig. 2..	22	......	18
Character of fracture........	Silky	Silky	Silky or fine granular
Cold bends without fracture..	†180° flat	‡ 180° flat	90° d=3t

* See paragraph 96. † See paragraphs 97, 98 and 99. ‡ See paragraph 100.

The yield point, as indicated by the drop of beam, shall be recorded in the test reports.

88. Allowable Variations—The ultimate strength, to be acceptable, shall be within 5000 lbs. of that desired.
89. Chemical Analysis—Chemical determinations of the percentages of carbon, phosphorus, sulphur and manganese shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector. Check analyses shall be made from finished material, if called for by the purchaser, in which case an excess of 25 per cent above the required limits will be allowed.
90. Form of Specimens—Plates, Shapes and Bars: Specimens for tensile and bending tests for plates, shapes and bars shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled to the usual form of a standard test specimen, 1½ ins. wide on a gaged length of 9 ins., or with both edges parallel, or they may be turned to a diameter of ¾ in. for a length of at least 9 ins., with enlarged ends.
91. Rivets—Rivet rods shall be tested as rolled.
92. Pins and Rollers—Specimens shall be cut from the finished rolled or forged bar, in such manner that the center of the specimen shall be 1 in. from the surface of the bar. The standard turned test specimen, ½ in. diameter in 2 ins. gaged length, shall be used for tensile tests. The specimen for bending test shall be 1 in. x ½ in. in section.
93. Steel Castings—The number of tests will depend on the character and importance of the castings. Specimens shall be cut cold from coupons molded and cast on some portion of one or more castings from each melt or from the sink heads, if the heads are of sufficient size. The coupon or sink head, so used, shall be annealed with the casting before it is cut off. Test specimens to be of the form prescribed for pins and rollers.
94. Annealed Specimens—Material which is to be used without annealing or further treatment shall be tested in the condition in which it comes from the rolls. When material is to be annealed, or otherwise treated before use, the specimens for tensile tests representing such material shall be cut from properly annealed or similarly treated short lengths of the full section of thebar.
95. Number of Tests—At least one tensile and one bending test shall be made from each melt of steel as rolled. In case steel differing ⅜ in. and more in thickness is rolled from one melt, a test shall be made from the thickest and thinnest material rolled.
96. Modifications in Elongation—For material more than ¾ in. in thickness, the following modification will be allowed in the requirements for elongation:

    For each ⅛ in. in thickness above ¾ in., a deduction of 1 will be allowed from the specified percentage.

97. Bending Tests—Bending tests may be made by pressure or by blows. Plates, shapes and bars less than 1 in. thick shall bend as called for in paragraph 86.
98. Thick material—Full-sized material for eye-bars and other steel, 1 in. thick and over, tested as rolled, shall bend cold 180 degs. around a pin, the diameter of which is equal to twice the thickness of the bar, without fracture on the outside of bend.
99. Bending Angles—Angles ¾ in. and less in thickness shall open flat, and angles ½ in. and less in thickness shall bend shut, cold, under blows of a hammer, without sign of fracture. This test will be made only when required by the inspector.
100. Nicked Bends—Rivet steel, when nicked and bent around a bar of the same diameter as the rivet rod, shall have a gradual break, and a fine, silky uniform fracture.
101. Finish—Finished material shall be free from injurious seams, flaws, cracks, defective edges or other defects, and have a smooth, uniform and workmanlike finish. Plates 36 ins. in width and under shall have rolled edges.
102. Stamping—Every finished piece of steel shall have the melt number stamped or rolled upon it. Steel for pins and rollers shall be stamped on the end. Rivet and lattice steel and other small parts may be bundled with the above marks on an attached metal tag.
103. Defective Material—Material which, subsequent to the above tests at the mills, and its acceptance there, develops weak spots, brittleness, cracks or other imperfections, or is found to have injurious defects, will be rejected at the shop and shall be replaced by the manufacturer at his own cost.

CAST IRON

104. Cast Iron—Except where chilled iron is specified, castings shall be made of tough gray iron, with sulphur not over 0.10 per cent. They shall be true to pattern, out of wind and free from flaws and excessive shrinkage. If tests are demanded, they shall be made on the "Arbitration Bar" of the American Society for Testing Materials, which is a round bar, 1¼ ins. diameter and 15 ins. long. The transverse test shall be made on a supported length of 12 ins. with load at middle. The minimum breaking load so applied shall be 2900 lbs., with a deflection of at least 1/10 in. before rupture.

TIMBER

105. Timber—The timber shall be strictly first-class white pine, Southern yellow pine or white oak bridge timber, sawed true and out of wind, full size, free from wind shakes, large or loose knots, decayed or sapwood, wormholes or other defects impairing its strength or durability.

VI. WORKMANSHIP

106. General—All parts forming a structure shall be built in accordance with approved drawings. The workmanship and finish shall be equal to the best practice in modern bridge works.
107. Straightening Material—Material shall be thoroughly straightened in the shop, by methods that will not injure it, before being laid off or worked in any way.
108. Finish—Shearing shall be neatly and accurately done and all portions of the work exposed to view neatly finished.
109. Size of Rivets—The size of rivets, called for on the plans, shall be understood to mean the actual size of the cold rivet before heating.
110. Punched Work—All riveted work shall be punched accurately. When pieces forming one built member are put together, the holes must be truly opposite. Drifting to enlarge unfair holes will not be allowed. If holes must be enlarged to admit the rivet they must be reamed. Poor matching of holes will be cause for rejection.
111. Rivet Holes—For all punched work, the diameter of the

punch shall not be more than 1/16 in. greater than the diameter of the rivet, nor the diameter of the die more than ⅛ in. greater than the diameter of the punch.

112. Thick Material Requiring Reaming—Material in main members over 11/16 in. thick shall have all holes sub-punched and reamed with twist drills. Material over ⅞ in. thick shall be drilled from the solid.

113. Field Connections—Holes for floor beam and stringer field connections shall be sub-punched and reamed with twist drills to a steel or iron template 1 in. thick. All other field connections may be punched providing they are carefully checked to template.

114. Sub-Punching and Reaming—Where reaming is required the punch used shall have a diameter of not less than 3/16 in. smaller than the nominal diameter of the rivet. Holes shall be reamed to a diameter not more than 1/16 in. larger than the diameter of the rivet.

115. Burrs—The outside burrs on reamed holes shall be removed.

116. Assembling—Riveted members shall have all parts well pinned up and firmly drawn together with bolts before riveting is commenced. Contact surfaces to be painted. (See 142.)

117. Lattice Bars—Lattice bars shall have neatly rounded ends, unless otherwise called for.

118. Web Stiffeners—Stiffeners shall fit neatly between flanges of girders. Where tight fits are called for the ends of the stiffeners shall be faced and shall be brought to a true contact bearing with the flange angles.

119. Splice Plates and Fillers—Web splice plates and fillers under stiffeners shall be cut to fit within ⅛ in. of flange angles.

120. Web Plates—Web plates of girders, which have no cover plates, shall be flush with the backs of angles or project above the same not more than ⅛ in., unless otherwise called for. When web plates are spliced not more than ¼ in. clearance between ends of plates will be allowed.

121. Connection Angles—Connection angles for floor beams and stringers shall be flush with each other and correct as to position and length of girder. In case milling is needed after riveting the removal of more than 1/16 in. from their thickness will be cause for rejection.

122. Riveting—Rivets shall be driven by pressure tools wherever possible. Pneumatic hammers shall be used in preference to hand driving.

123. Rivets—Rivets shall look neat and finished, with heads of approved shape, full and of equal size. They shall be central on shank, and grip the assembled pieces firmly. Recupping and calking will not be allowed. Loose, burned or otherwise defective rivets shall be cut out and replaced. In cutting out rivets great care shall be taken not to injure the adjacent metal. If necessary, they shall be drilled out.

124. Bolts in Place of Rivets—Wherever bolts are used in place of rivets which transmit shear, the holes shall be reamed parallel, and the bolts must have a driving fit. A washer not less than ¼ in. thick shall be used under nut.

125. Members to be Straight—The several pieces forming one built member shall be straight and fit closely together, and finished members shall be free from twists, bends or open joints.

126. Finish of Joints—Abutting joints shall be cut or dressed true and straight and fitted close together, especially where open to view. In compression joints depending on contact bearing, the surfaces shall be truly faced, so as to have even bearings after they are riveted up completely and when perfectly aligned.

127. Eye-Bars—Eye-bars shall be straight and true to size, and shall be free from twists, folds in the neck or head, or any other defect. Heads shall be made by upsetting, rolling or forging. Welding will not be allowed. The form of heads will be determined by the dies in use at the works where the eye-bars are made, if satisfactory to the engineer, but the manufacturer shall guarantee the bars to break in the body when tested to rupture. The thickness of head and neck shall not vary more than 1/16 in. from the specified thickness. (See 153.)

128. Boring Eye-Bars—Before boring, each eye-bar shall be properly annealed and carefully straightened. Pin holes shall be in the center line of bars and in the center of heads. Bars of the same length shall be bored so accurately that, when placed together, pins 1/32 in. smaller in diameter than the pin holes, can be passed through the holes at both ends of the bars at the same time without forcing.

129. Pin Holes—Pin holes shall be bored true to gages, smooth and straight; at right angles to the axis of the member and parallel to each other, unless otherwise called for. The boring shall be done after the member is riveted up.

130. Variation in Pin Holes—The distance center to center of pin holes shall be correct within 1/32 in., and the diameter of the hole not more than 1/50 in. larger than that of the pin, for pins up to 5 ins. diameter, and 1/32 in. for larger pins.

131. Pins and Rollers—Pins and Rollers shall be accurately turned to gages and shall be straight and smooth and entirely free from flaws.

132. Screw Threads—Screw threads shall make tight fits in the nuts, and shall be United States standard, except above the diameter of 1⅜ ins., when they shall be made with six threads per inch.

133. Annealing—Steel, except in minor details, which has been partially heated, shall be properly annealed.

134. Steel Castings—All steel castings shall be annealed.

135. Welds—Welds in steel will not be allowed.

136. Bed Plates—Expansion bed plates shall be planed true and smooth. Cast wall plates shall be planed top and bottom. The cut of the planing tool shall correspond with the direction of expansion.

137. Pilot Nuts—Pilot and driving nuts shall be furnished for each size of pin, in such numbers as may be ordered.

138. Field Rivets—Field rivets shall be furnished to the amount of 15 per cent, plus ten rivets in excess of the nominal number required for each size.

139. Shipping Details—Pins, nuts, bolts, rivets and other small details shall be boxed or crated.

140. Finished Weight—Payment for pound price contract shall be by scale weight. No allowance over 2½ per cent of the total weight of the structure as completed from the plans will be allowed for excess weight.

VII. SHOP PAINTING

141. Cleaning—Steel work, before leaving the shop, shall be thoroughly cleaned and given one good coating of pure linseed oil, or such paint as may be called for, well worked into all joints and open spaces.

142. Contact Surfaces—In riveted work, the surfaces coming in contact shall each be painted before being riveted together.

143. Inaccessible Surfaces—Pieces and parts which are not accessible for painting after erection, including tops of stringers, eye-bar heads, ends of posts and chords, etc., shall have a good coat of paint before leaving the shop.

144. Condition of Surfaces—Painting shall be done only when the surface of the metal is perfectly dry. It shall not be done in wet or freezing weather, unless protected under cover.

145. Machine-Finished Surfaces—Machine-finished surfaces shall be coated with white lead and tallow before shipment, or before being put out into the open air.

VIII. INSPECTION AND TESTING

146. Facilities for Inspection—The manufacturer shall furnish all facilities for inspecting and testing the weight, quality of material and workmanship. He shall furnish a suitable testing machine for testing the specimens, as well as prepare the pieces for the machine, free of cost.

147. Access to Shop—When an inspector is furnished by the purchaser he shall have full access at all times to all parts of the works where material under his inspection is manufactured.

148. Copies of Mill Orders—The purchaser shall be furnished with complete copies of mill orders, and no material shall be rolled and no work done before he has been notified as to where the orders have been placed, so that he may arrange for the inspection.

149. Starting Work in Shop—The purchaser shall also be furnished with complete shop plans, and must be notified well in advance of the start of the work in the shop, in order that he may have an inspector on hand to inspect the material and workmanship.

150. Shipping Invoices—Complete copies of shipping invoices shall be furnished to the purchaser with each shipment.

151. Accepting Material or Work—If the inspector, through an oversight or otherwise, has accepted material or work which is defective or contrary to the specifications, this material, no matter in what stage of completion, may be rejected by the purchaser.

IX. FULL-SIZED TESTS

152. Test to Prove Workmanship—Full-sized tests on eye-bars and similar members, to prove the workmanship, shall be made at

the manufacturer's expense, and shall be paid for by the purchaser at contract price, if the tests are satisfactory. If the tests are not satisfactory, the members represented by them will be rejected.

153. Eye-Bar Tests—In eye-bar tests, the fracture shall be silky, the elongation in 10 ft., including the fracture, shall be not less than 15 per cent; and the ultimate strength and true elastic limit shall be recorded. (See 127.)

ERECTION

154. If the contractor erects the bridge he shall, unless otherwise specified, furnish all staging and falsework, erect and adjust all the metal work, and shall frame and put in place all floor timbers and guard rails, etc., complete, ready for the rails.

155. The contractor shall put in place all stone bolts and anchors for attaching the steel work to the masonry. He shall drill all the necessary holes in the masonry, and set all bolts in neat Portland cement.

156. The erection will also include the unloading of materials after delivery and their proper care until the erection is complete.

157. Whenever the new structures are to replace existing ones, the latter shall be carefully taken down and removed by the contractor to some place where it can conveniently be loaded on cars.

158. The contractor shall so conduct all his work as not to impede the operation of the road, interfere with the work of other contractors or close any thoroughfare on land or water.

159. The contractor shall assume all risks of accidents and damage to persons and properties prior to the final acceptance of the completed structure by the railway company.

160. The contractor must also remove all false work, piling and other obstructions or unsightly material produced by his operations.

PAINTING AFTER ERECTION

161. After the structure is erected the metal work shall be thoroughly cleansed from mud, greases or any other objectionable material that may be found thereon, then thoroughly and evenly painted with two coats of the kind the engineer may select, mixed with pure linseed oil. All recesses which will retain water, or through which water can enter, must be filled with thick paint or some waterproof cement before receiving the final painting. The different coats of paint must be of distinctly different shades or colors, and one coat must be allowed to dry thoroughly before the second coat is applied. No painting shall be done in wet or freezing weather.

ARRANGEMENTS FOR THE COLUMBUS CONVENTION

The various committees and secretaries which have charge of the work of preparing for the meeting of the street railway associations in Columbus have been very busy during the last few weeks. The committee on rules and the Engineering and American committees on standards have held several meetings in New York during the past few days to decide upon the final forms of their reports. Secretary Swenson, of the American Association, has mailed to each member a handsome illustrated pamphlet on Columbus, issued by the Board of Trade of that city and giving valuable information and statistics as to the city and interesting points to visit. In all between thirty and forty papers and reports will be presented at the different meetings. Of these a large proportion have already been received by the general secretary and are now in the printer's hands. The secretary is working on a bulletin which will be issued next week and which will cover the matter of railroad rates and special trains to the convention.

The American Street and Interurban Railway Engineering Association has announced the composition of its Columbus local committee. It will consist of the following gentlemen: E. O. Ackerman, chairman, Columbus Railway & Light Company, Columbus; L. C. Bradley, Scioto Valley Traction Company, Columbus, Ohio.; W. P. Jackson, Columbus, London & Springfield Company, Columbus; W. H. Evans, Indianapolis Traction & Terminal Company, Indianapolis; Burr S. Watters, assistant engineer of way, Columbus Railway & Light Company; E. H. Hitchcock, professor of experimental engineering at the Ohio State University.

The executive committee of the Manufacturers' Association held a meeting at Columbus on Sept. 19 and 20, going over the plans for accommodations, entertainments and exhibits. Owing to the tremendous demand for space this year, it has been decided to utilize the sixth building in the group of State Fair buildings, which will be devoted to the convention exhibit, and which it was first thought would not be required. The following is a list of the companies which have recently been assigned space at the convention buildings, and is supplemental to the list published in the Street Railway Journal for Aug. 11:

Berry Bros., Ltd., Detroit, Mich.
Standard Motor Truck Company, Pittsburg, Pa.
Jno. A. Roeblings' Sons Company, Trenton, N. J.
Liberty Bell Company, Bristol Conn.
Elliott Bros. Electric Company, Cleveland, Ohio.
Watson Stillman Company, New York.
National Carbon Company, Cleveland, Ohio.
Grip Nut Company, Chicago.
Emil Calman & Company, New York.
"Electrical Review," New York.
Standard Brake Shoe Company, Aurora, Ill.
Climax Stock Guard Company, Chicago.
Baldwin Steel Company, New York.
Columbia Machine Works, Brooklyn, N. Y.
Magann Air Brake Company, Toronto, Canada.
The Electric Railway Improvement Company, Cleveland, Ohio.
New York Switch & Crossing Company, Hoboken, N. J.
Philip Carey Manufacturing Company, Cincinnati, Ohio.
Crouse-Hinds Company, Syracuse, N. Y.
Heany Fire Proof Wire Company, York, Pa.
The Jenkins Auto Fender Company, Toronto, Canada.
Novelty Incandescent Lamp Company, St. Mary's, Pa.
The Riverside Metal Company, Riverside, N. J.
W. N. Matthews & Bro., St. Louis, Mo.
American Advertising Indicator Company, St. Joseph, Mo.
Ramapo Iron Works, New York.
Pittsburg Steel Company, Pittsburg, Pa.
Chicago Pneumatic Tool Company, Chicago.
J. Frank Lanning & Company, Pittsburg, Pa.
Cary Automatic Coupler Company, Chicago.
U. S. Electric Signal Company, West Newton, Mass.
J. P. Sjoberg & Company, New York.
Semon Bache Company, New York.
S. W. Bird & Son, East Walpole, Mass.
J. A. Fay & Egan Company, Cincinnati, Ohio.

The new limited service between Cleveland and Canton over the lines of the Northern Ohio Traction & Light Company and the Canton-Akron Railroad Company started last week. There are three limiteds each way daily between Cleveland and Canton in addition to the three limiteds over the Northern Ohio line from Cleveland to Akron, thus making six limited cars each way daily between Cleveland and Akron. The new limiteds do not run to the Union Station in Akron, although they pass through the center of the town. They make the 62 miles in 2 hours and 40 minutes, an improvement of one hour over the present local service. By reason of the absorption of the Canton-Akron system by the Northern Ohio Traction and Light Company, which goes into effect Sept. 18, Canton will be made a division point and passengers for Massilon and New Philadelphia and other points south of Canton will change cars in Canton. In the past through cars have been run between Canton and New Philadelphia.

NEW ROLLING STOCK FOR NASHVILLE

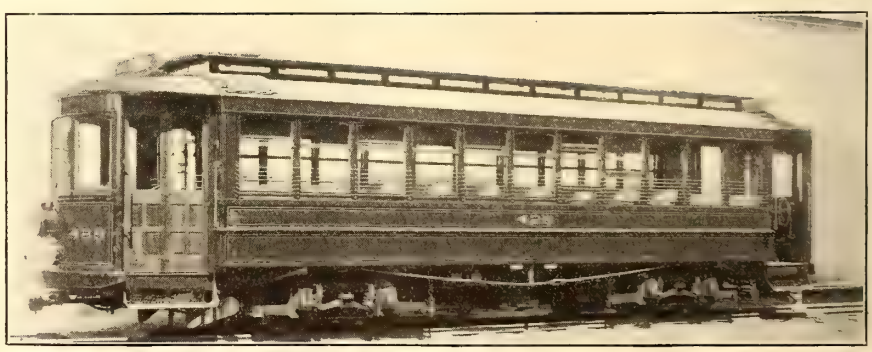
Ten cars of the Nashville Railway & Light Company which went forward last week from the J. B. Brill Company's works are built especially low, a slight decrease being made in the height of the roof, deck and body sash; the truck, too, is made 2½ ins. lower than the standard 27-G1 truck on which the cars are mounted. The height of car from the rail over

HEAD-ON VIEW OF NASHVILLE CAR

the trolley is 11 ft. 4⅝ ins.; from the track to the bottom of the sill, 32⅜ ins.; bottom of the sill over the roof, 8 ft. 6¾ ins. The vestibules are extra narrow at the end to take care of cars passing on curves. Both incandescent and arc headlights are carried, the former to be used on country roads where the maximum speed is attained and where it is essential that a bright light be thrown on the tracks and well distributed, which will enable the motorman to keep a sharp lookout for any obstructions. The car-builders' improved track scraper is installed at each end of the car and is utilized to insure a good contact with the rails. This device will be particularly effective in the country where roads cross the tracks at grade and where dirt and dust is most likely to accumulate. As very little snow falls in Nashville the track scraper will adequately perform the duty required of it at all seasons of the year.

The car interiors are furnished with an abundance of artificial light which is thrown from the continuous line of lights placed along the lower ventilator rails instead of the usual clusters in the ceilings. The low window sills which have done so much to make the grooveless post and semi-convertible car popular are amply protected by continuous safety guards, and such accessories as thermometers and fire extinguishers also have their place. It is an interesting fact that Brill semi-convertible cars constitute practically the entire equipment of the Nashville Railway, and the present consignment will make seventy of this type furnished this road by the same builders.

A natural finish of cherry forms the interiors; ceilings are of bird's-eye maple. The chief dimensions are: Length over the end panels, 30 ft. 6 ins., and over the vestibules, 40 ft. 6 ins.; width over the sills including the sheathing, 8 ft. 1½ ins.; size of the side sills, 4¾ ins. x 7¾ ins.; end sills, 5¼ ins. x 6⅞ ins.; sill plates, ⅜ ins. x 12 ins.; thickness of the corner posts, 4½ ins. x 6⅝ ins.; thickness of the side posts, 3¼ ins. The wheel base of the trucks is 4 ft. The wheel and axle diameters are standard, and four 50-hp motors are on each car.



DOUBLE-TRUCK VESTIBULED CAR FOR NASHVILLE

PASSENGERS ASKED TO HELP IMPROVE SERVICE

In the "Tri-State Tourist," which is the monthly traffic publication of the Boston & Northern and Old Colony Street Railways, the policy of the company, in regard to complaints, is explained to the public in the following words:

In the hustle and veritable swarm of details incident to operating hundreds of miles of electric railway, no matter how great care and attention is given to details, there will be little faults here and there. Some of these are discovered and promptly remedied. Others go on and on until some day there is an especially strong protest from the public and the managers learn of them for the first time.

When the managers have the knowledge of these little deficiencies there is a chance to correct them; when they are not called to their attention there is none. For this reason it is within the province of the public to do much for their own comfort and convenience by promptly reporting anything that they see is radically wrong to the division superintendents of the company. It is a duty passengers owe to themselves and the general welfare. Their complaints will be thankfully received, and they will not be looked upon as belonging in the category of "kickers." Many hesitate to make complaints fearing to be misunderstood. This is a wrong view.

When anything is wrong the company wants to know it, and will do what it can to make things right. That this may be better understood the Boston & Northern and Old Colony companies have prepared large signs to be placed in all of their cars asking the passengers to co-operate with the companies to improve the service.

This is supplemented by a card in the cars which reads as follows:

Report in writing to local office any discourtesy or inattention to duty on the part of employees, suggestions for improving service or matters of general interest to us. Such reports will be given our careful consideration.

To give still wider publicity to this notice, copies of it have been sent to local newspapers for publication.

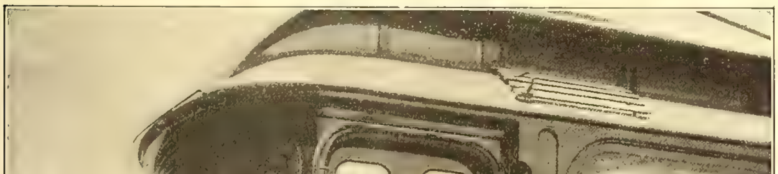
RATE WAR IN INDIANA

The first step in a rate war on lines in the vicinity of Evansville, Ind., will be taken Oct. 1, when the new commutation tariff of the Southern Railway goes into effect on their Lincoln City-Evansville line with a fare 10 cents less between all points than now charged by the Evansville, Suburban & Newburg Electric Railway. The steam line proposes to run three trains each way daily, and has made three forms of books to be sold at the above named rates—a business man's, a family and a school children's rate. The interurban road will meet the cut rate.

WIRE GLASS FOR VESTIBULE SASH

The use of wire glass for elevator shafts, skylights, windows and other places is growing rapidly, so that the suggestion to employ it for sash is interesting. The advantages in avoiding accident from flying glass are obvious. With the tenacity with which the various fragments of a sheet of wire glass are held together under the stress of impact breakage, it is difficult to conceive of personal damage being caused through its breakage even under severe conditions. There is, it is true, a slight loss in transparency, but whether this would militate against its use either for side sash or for vestibules is as yet a question.

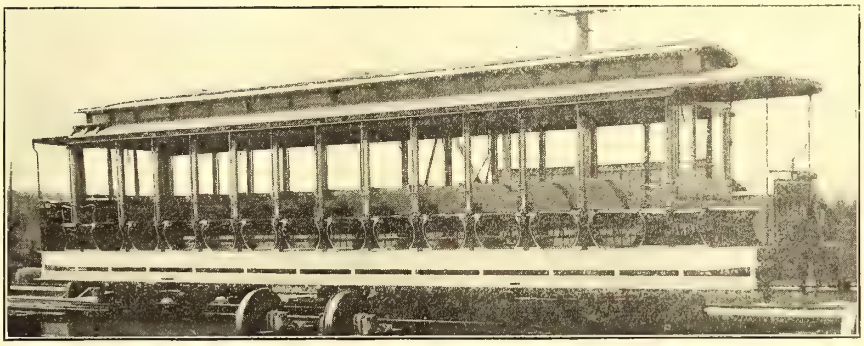
To determine this point the St. Louis & Suburban Company equipped some time ago the vestibules of one of its cars with polished wire glass. The car was a private car, built some eight or ten years ago by the St. Louis Car Company, and fitted with open platforms. In 1903 the car was rebuilt at the company's shops, vestibules were added and the wire glass sash were inserted. Since that time several of these sash have been broken by people falling against them, but the glass remained intact and the person was not cut. At another time a motorman broke the glass while raising the sash during a heavy rain, but the wire held the glass together and no water leaked in. The car has not been in a collision. The only objection so far developed is that owing to the fine mesh used some motormen have objected to the car on account of the effect of the wire mesh on the vision during a fast or long run. Experience has shown, however, that consciousness of the mesh disappears after a few days, the eyes of the motorman seeming to focus beyond the glass.



CAR VESTIBULE AND DOOR WITH WIRE GLASS

OPEN CARS FOR THE ATLANTIC COAST ELECTRIC RAILWAY

There are numerous roads throughout the country whose chief source of revenue is derived from the handling of large crowds of excursionists during the summer months, and a line of this kind is the Atlantic Coast Electric Railway, with headquarters at Asbury Park. Starting from Asbury Park in either direction numerous popular watering places and amusement resorts are passed, and at the height of the season the capacity of the rolling stock is taxed to the utmost. The annual military operations at Sea Girt, the terminus, attract thousands of visitors, and Belmar, Avon-on-Sea and Spring Lake all get their share of patronage, and in the other direction from Asbury Park as far as Long Branch, the other terminal of the lines, traffic is equally brisk, Pleasure Bay with its fine park, as well as the famous New York resort mentioned, affording very pleasant stopping-off places. A variation in the trip to New York City may be had by taking the trolley to Pleasure Bay, thence direct to the metropolis by steamer. Many passengers board the cars merely for the sake of the exhilarating ride along the coast and to enjoy the scenery, which is most diversified and charming.



OPEN CAR FOR ATLANTIC COAST ELECTRIC RAILWAY

The big open cars of the present order which were built by the John Stephenson Company are duplicates of those ordered from the same builders a little over a year ago, which were in turn duplicated in 1903 and, needless to say, they have answered their purpose admirably on this line of heavy travel. Each car will seat seventy-five passengers, and the type of truck employed is the "Eureka" maximum traction with a wheel base of 4 ft. The chief dimensions of the cars are: Length over the end panels, 33 ft. 4 ins., and over the crown pieces, 42 ft.; width over the sills, 6 ft. 7⅞ ins., and over the posts at the belt, 7 ft. 3 ins.; height from the floor to the ceiling, 7 ft. 8½ ins. Other features of the car will be noted by consulting the illustration. The curtains may be pulled down to the floor, the round corner seat end panels which are used being so arranged in connection with the grooves in the posts as to permit the curtains coming down over the posts outside of the panels, a continuation of the grooves of the posts being formed in the exterior of the panel. Each car is furnished with two motors of 40-hp capacity each, together with a number of the manufacturer's specialties.

FINANCIAL INTELLIGENCE

WALL STREET, Sept. 19, 1906.

The Money Market

Although the monetary situation has been greatly improved during the past week, there has been no marked relaxation in rates for money. The tone of the market has been firm throughout, due to the enormous volume of business being carried on in all branches of trade and to an active stock speculation, and which have been accompanied by a heavy demand for funds in all sections of the country. Money on call ranged between 10 and 2 per cent, the average for the week being about 6 per cent. In the time loan department, maturities extending from 90 days to six months inclusive, commanded 6 per cent, and a premium bringing the total charge up to 7½ and 8 per cent, altohugh in special instances transactions for the long period were made at 6 per cent and at 6½ per cent, the character of the collateral and the standing of the borrower being taken into consideration. By far the most important development of the week has been the very substantial gains in cash by the New York City banks resulting from the heavy importation of gold from Europe. Up to the present time the Treasury Department has advanced $21,628,000 to the national banks under the relief plan adopted by Secretary Shaw, and which went into effect on Sept. 10. In addition to this considerable amounts of gold have been engaged upon which no advances have yet been made, and it is expected that by the end of the current week the amount advanced to local banks will be close to $30,000,000. This does not include several million dollars engaged in the Australian market nor the $2,000,000 imported by a Boston institution last week. Gold amounting to $4,000,000 will also arrive from Europe during the week, against which no advances have been made, the engagement taking place before the Treasury plan went into effect. The result of these heavy importations of gold has been to strengthen materially the position of the local banks, notwithstanding the heavy transfers of currency to San Francisco, and to the heavy shipments of currency to the interior cities for crop-moving purposes. The outflow of money during the past week has been heavy, and all indications point to a continuation of the movement on a large scale. The foreign exchange market has ruled steady throughout the week, and, notwithstanding the advances in discount rates by the Bank of England and Imperial Bank of Germany, the engagements of gold for import have continued and are likely to continue for some time. The bank statement published on last Saturday, although not up to expectations, was nevertheless a very gratifying document. Loans showed a further contraction of $15,313,700 as a result of the shifting of loans to other institutions. The increase in cash amounted to $7,932,700, and as the reserve required was $2,181,625 less than in the previous week, the surplus reserve was increased by $10,114,325, which not only wiped out the deficit of $6,557,925 reported in the week ending Sept. 8, but established a surplus of $3,536,400. In the corresponding week of 1905, the surplus was $4,635,300; in 1904, $29,353,150; in 1903, $13,173,625; in 1902, a deficit of $1,642,050; in 1901 a surplus of $13,654,225 and in 1900, $20,836,175.

The Stock Market

Speculative activity in the stock market increased and during the week there was a broadening of interest which suggests even greater activity before any serious break in prices will occur. Sentiment is strongly bullish and the dominant interests are encouraging the development of this feeling with a view to a larger participation on the part of the public. Apart from the firmness in money, conditions are all favorable. The action of Secretary Shaw in advancing to national banks the full amount of the gold engaged for import has been followed by engagements of over $23,000,000, and the indications are that over $30,000,000 will be brought from Europe on this movement. The advance in the Bank of England discount rate has been followed by an increase in the Imperial Bank of Germany rate to 5 per cent, and it is likely that we will be able to draw additional supplies of the yellow metal from Europe. The important point is that we have been able to obtain abroad a considerable amount of money that the New York City banks will be called upon to send to the interior for crop-moving purposes, and to this extent the financial situation has been improved. If our imports of gold fall below requirements, the Federal Treasury is in a position to deposit funds in the country banks to an extent that will offset the drain upon the local institutions. The improvement in the stock market and the more bullish feeling are not entirely the result of the improvement in the monetary position. They have been influenced to a large extent by the increase in the Union Pacific dividend, the beginning of dividends on Southern Pacific and by the prospects of a more liberal dividend policy on the part of many other corporations. The re-instatement of Steel common to the dividend list has had a very favorable influence, as this stock is widely held, and intimations that it will be placed upon a 4 per cent basis are receiving consideration. The copper stocks have been features and both Amalgamated and Anaconda made large advances, the improvement having been based on rumors that the dividend on Anaconda will again be increased, and that Amalgamated will be placed on a higher dividend basis next month. The prosperous condition of the copper metal trade warrants such action and the market action of the stocks would justify the anticipated increase. Rumor has it that there is to be a radical change in the position of the coal-carrying properties, and it is intimated that the Union Pacific will have a large interest in Baltimore & Ohio as a result of the recent sale of the Pennsylvania holdings of that stock. It is expected that the dividend on Pennsylvania will be increased, and that Norfolk & Western and Chesapeake & Ohio will go on a higher dividend basis.

Prices are now on a high level, and many of the leading dividend payers return less on the investment than can be obtained by lending money at ruling rates. Such a situation usually precedes a change in the market position, and it is obvious that the bull-market cannot be carried much further, unless there is assurances of more liberal supplies of money. The prosperity of the country employs all available funds, and while the market holds strong and promises to go higher, it is time to adopt a cautious policy.

The local traction stocks have been held back, but the heavy earnings of these companies must tell in the long run. It has been demonstrated that the Brooklyn Rapid Transit Company can earn and pay dividends even though such payment may not be advisable just yet. If it can earn 5 per cent over and above all charges, the outlook is certainly very flattering.

Philadelphia

The overshadowing feature in the market for the local traction shares this week has been the enormous dealings in Philadelphia Rapid Transit which were accompanied by fractionally higher prices. In the early dealings the stock ran off from 29⅝ to 29, but later in the week a heavy demand developed for the stock, which carried the price up to 29¾. It was reported that a large block of the stock which had been hanging over the market has been taken up, and subsequently the announcement was made that a syndicate had taken over the holdings of J. J. Mack. From 29¾ the price reacted a fraction, but near the close it advanced to 30⅛ and closed near the highest. It is said that August Loeb, vice-president of a local bank, will succeed Mr. Mack as a director in the company. Upwards of 35,000 shares of the stock changed hands. Otherwise the market was dull and devoid of special feature. American Railways fell from 51 to 51¾, and Union Traction advanced from 63¾ to 64⅛, on purchase of odd lots. Other transactions included Philadelphia common 49¾ to 49½; preferred at 48½; Philadelphia Traction at 98½, United Companies of New Jersey at 255 to 254; United Traction of Pittsburg 50½ to 50; Fairmount Park Transportation at 16, Fort Worth & Wabash Valley Traction at 26½ and Consolidated Traction of New Jersey at 78⅝ to 78.

Baltimore

Trading in the traction issues at Baltimore was unusually quiet and featureless. United Railway issues were firm, the free stock selling at 14½, and the deposited stock changing hands at prices ranging from 15 to 15½. About $25,000 of the 4 per cent bonds sold from 89¼ to 89½, and about $50,000 of the deposited incomes brought prices ranging from 69¾ to 70½. A small lot of the new funding 5s sold at 88½. Washington City & Suburban 5s sold at 103.

Other Traction Securities

The Boston market was decidedly strong, but the dealings for the most part were confined to small amounts. Massachusetts Electric stocks were exceptions to the general rule, about 1000 shares of the common changing hands from 20 to 21, while about 600 shares of the preferred sold from 70½ to 73½. Boston & Suburban common advanced from 17 to 18½, and the preferred sold at 81¾. Boston Elevated sold at 153⅝ and 153½, and West End sold at 97. In the Chicago market a larger number of issues were traded in, but the individual totals were comparatively small. Chicago Union Traction advanced from 4¾ to 5⅛ and the preferred sold at 19 to 18¾. Metropolitan Elevated preferred brought 67½ and 67, and South Side Elevated sold at 96½ and 96. North Chicago changed hands at 36, and West Chicago declined from 35½ to 32.

The inactivity of traction securities in Cincinnati continues. Cincinnati Street Railway sold in several lots at 143, even with the former price. Cincinnati, Newport & Covington preferred sold at 97 and 97¼, also no change. Columbus Railway sold at 111, an advance of ½. Toledo Railways & Light at 32, a decline of ¼, and a block of Northern Ohio Traction 5s at 100, an advance of ¼.

There were but few traction sales in Cleveland. Cleveland & Southwestern sold at 14½, and Lake Shore Electric at 15¼, both fractional declines from last sale. Northern Ohio Traction advanced fractionally to 29, due to the absorption of the Canton-Akron system. Cleveland Electric and Forest City Electric, the two conspicuous tractions were inactive, a small lot of the former selling at 71, even with previous sales.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Sept. 12	Sept. 19
American Railways	51¾	51¾
Boston Elevated	153½	153¾
Brooklyn Rapid Transit	80¼	80⅛
Chicago City	160	160
Chicago Union Traction (common)	4¾	4¾
Chicago Union Traction (preferred)	18	18
Cleveland Electric	71	70
Consolidated Traction of New Jersey	—	77
Detroit United	93	94
Interborough-Metropolitan, W. I.	38¼	38⅝
Interborough-Metropolitan (preferred), W. I.	77¾	77½
International Traction (common)	54½	54½
International Traction (preferred), 4s	76	76
Manhattan Railway	147	144¼
Massachusetts Electric Cos. (common)	20	20
Massachusetts Electric Cos. (preferred)	72	72½
Metropolitan Elevated, Chicago (common)	26	26
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	106	107
North American	91	92⅞
North Jersey Street Railway	27	27
Philadelphia Company (common)	49½	—
Philadelphia Rapid Transit	29	29¾
Philadelphia Traction	*98	98½
Public Service Corporation certificates	69	69½
Public Service Corporation 5 per cent notes	94½	—
South Side Elevated (Chicago)	96	95
Third Avenue	124	126
Twin City, Minneapolis (common)	113	114½
Union Traction (Philadelphia)	63	64
West End (common)	—	—
West End (preferred)	—	—

* Ex-dividend.

Metals

According to the "Iron Age," there is no sign of a let-up in the demand for iron and steel. During the first two weeks of the current month, the United States Steel Corporation booked an average of 60,000 tons per day, which contrasts with a capacity of 33,000 per day. The principal merchant furnaces in the valleys are sold up tight into the second quarter of next year. One leading iron producer in the South has this week sold 40,000 tons of basic pig to Western steel makers, the bulk of it at $15.50 Birmingham.

Copper metal continues strong; prices for all grades making further advances during the week. Quotations are: Lake, 19⅛ to 19⅜c; Electrolytic, 19 to 19⅛c, and castings, 18¾ to 19c.

ANNUAL REPORT OF THE NORTHWESTERN ELEVATED

The report of the Northwestern Elevated Railroad for the year ended June 30, 1906, has been issued under date of Sept. 14. The figures contained in the report follow substantially as given there:

INCOME ACCOUNT OF THE YEAR ENDING JUNE 30, 1906

Passenger earnings		$1,456,454.01
Other earnings (including loop net earnings)		492,273.27
Total earnings		$1,948,727.28
OPERATING EXPENSES		
Maintenance of way and structure	$65,092.09	
Maintenance of equipment	147,387.13	
Conducting transportation	415,555.80	
General expenses	7,537.76	
		705,572.78
Net earnings		$1,243,154.50
CHARGES		
†Taxes	$171,624.04	
Bond interest	783,466.53	
Other interest	7,565.92	
		962,656.49
Surplus for year		$280,498.01

The above figures include $71,700 set aside in monthly instalments as a reserve for future betterments and maintenance, $41,700 on main line, and $30,000 on loop division.

† Includes compensation to city on account of loop.

* GENERAL BALANCE SHEET—JUNE 30, 1906

Assets

Cost of road and equipment		$30,133,939.63
Land and buildings		442,022.42
Stocks and bonds		82,515.14
Cash and bills receivable		746,529.58
Accounts receivable		121,443.50
Materials and supplies on hand		7,131.61
Unadjusted accounts		403,018.51
		$31,936,600.39

Liabilities

Capital Stock—		
Preferred	$5,000,000	
Common	5,000,000	
		$10,000,000.00
Bonds	$19,624,000	
Less bonds owned	1,142,000	
		18,482,000.00
Mortgages		126,850.00
Reserved for taxes		241,839.50
Accrued interest on bonds		242,691.66
Reserved for maintenance		238,762.70
Accounts and notes payable		1,297,297.90
Unadjusted accounts		5,723.75
Profit and loss		1,301,434.88
		$31,936,600.39

* Includes loop division.

COMPARATIVE STATEMENT OF DAILY AVERAGE PASSENGER TRAFFIC PER MONTH DURING THE YEARS ENDING JUNE 30, 1901, 1902, 1903, 1904, 1905 AND 1906

Month	1903	1904	1905	1906
July	56,110	59,393	60,816	67,496
August	57,911	60,093	62,453	68,938
September	63,950	68,107	66,407	74,307
October	69,562	71,617	73,385	80,642
November	67,236	71,422	74,307	83,597
December	71,607	76,259	78,263	87,199
January	68,266	70,204	73,728	81,204
February	69,885	73,193	78,773	83,572
March	70,070	74,344	80,500	85,154
April	71,340	74,217	79,779	84,244
May	66,990	69,232	77,863	81,748
June	66,571	68,222	75,837	80,165
Daily average	66,591	69,664	73,460	79,816

Total number of passengers carried year ending June 30, 1901	18,950,167
Total number of passengers carried year ending June 30, 1902	21,769,079
Total number of passengers carried year ending June 30, 1903	24,305,704
Total number of passengers carried year ending June 30, 1904	25,497,079
Total number of passengers carried year ending June 30, 1905	26,812,825
Total number of passengers carried year ending June 30, 1906	29,132,871
Daily average passengers carried year ending June 30, 1906	79,816
Daily average passengers carried year ending June 30, 1905	73,460
Average daily increase	6,356
Equal to	8.65
Ratio of operating expenses, including maintenance reserve, to earnings	46.62 per cent
Ratio of operating expenses, maintenance, reserve, loop account and taxes to earnings	62.72 per cent

MUELLER LAW DECISION IN CHICAGO—VALUES OF INTANGIBLE PRORERTIES OF COMPANIES SUBMITTED TO THE CITY

Judge Thomas G. Windes, in the Circuit Court, on Saturday, Sept. 15, refused to enjoin the city authorities from issuing certificates under the Mueller law for the purchase of the local street railway companies in any sum not over $75,000,000. This was the first hearing in the case, and the matter will be taken to the Supreme Court of the State, from which an opinion is hoped some time next month.

The Mueller law was the act passed by the State Legislature under which the City of Chicago was authorized to issue certificates in amount not exceeding $75,000,000 for the purpose of acquiring and operating the street railways of the city. A committee of taxpayers opposed to municipal ownership attacked the constitutionality of the law, and at the same time the legality of certain ordinances passed by the City Council of the city of Chicago, also looking to the control by the city of the street car systems. The city filed a demurrer to the bill of complaint entered by the committee.

The decision of Judge Windes upheld the constitutionality of the law, approved every step that the city had taken in following the provisions of the law, and finally dismissed the bill of complaint for want of equity. The court declared that it was the evident purpose of the Legislature and of the City Council to give the city the right to own and operate the street railways. He declared that while there might be some doubt in some points regarding the intention of the Legislature, he believed the doubt should favor what appeared to be the intention of the enactment of the measure. The court held, in brief:

"That it is clear that the Legislature intended that no debts should be incurred by the city under the Mueller certificates, that the only purpose of the city was to acquire income from street railways, to be purchased by the issuance of bonds; that the city has the right under the Mueller law to condemn property for the extension of the street car system, which it proposes to acquire; that the law itself is constitutional; that all ordinances passed by the city with the purpose of furthering the working of the law are legal."

It was claimed by the complainants that the Mueller law was unconstitutional because it was a local or special act. The court held that it was not a local law, and applied to every other city in the State as much as it did to the city of Chicago.

The Chicago City Railway and the Chicago Union Traction Company have submitted to the local transportation committee of the Chicago City Council their estimates of the value of the intangible properties of each company. The Chicago City Railway reports that it values its unexpired franchises and other rights at $10,332,228, while the figures of the Union Traction Company for its rights and franchises are $13,825,040.

Figures as to the "tangible values" of each road were submitted several months ago. For the Chicago City Railway these were $20,103,906, and for the Union Traction Company $27,401,-218. The total value of the tangible and intangible properties of both roads, as figured by the companies is $71,662,422. This is the sum the city is asked to consider the roads worth in the event that it make a settlement with the companies upon an indeterminate license plan.

Detailed statements of values were given by neither company, as it was considered that this would not be helpful to the companies. The value submitted by the Chicago City Railway was based on the following assumptions:

"1. That taking into account the existing situation a fair allowance to the company for its intangible rights would be the value of right of the company to operate its entire system for a term of seven years.

"2. That the gross receipts from the operation of the company's street railways would increase at the rate of 5 per cent in each year over the gross receipts for the preceding year.

"2. That the net profits from the operation of its street railways would amount to 30 per cent of its gross receipts, less interest on the value of the company's tangible property."

Seventy per cent of the gross receipts was taken as the cost of operation, and the present value of the intangible properties was considered as being the present worth of the net profits for seven years.

The figures submitted by the Chicago Union Traction Company do not include the value of the Chicago Consolidated Traction Company.

As with the City Railway so with the Union Traction Company. It bases its values on seven years operation. The gross receipts are assumed to increase 10 per cent the first year and 5 per cent each succeeding year, and the cost of operation is assumed to be 70 per cent of the gross receipts.

The figures submitted by both companies will be compared with the estimates now being made by the city's special commission on values. In regard to the values submitted, Mayor Dunne said: "The figures are excessive. The city experts and the committee will act in conjunction in deciding how much too high they are. I can duplicate the street car lines in the city, street for street, for less than $70,000,000, with absolutely new material."

Mayor Dunne announces that as a result of the Mueller traction decision the City Council will continue to negotiate with present companies for the reconstruction of the properties and for their operation until the city can purchase them.

SEATTLE'S MUNICIPAL OWNERSHIP PLAN DEFEATED AT POLLS

Municipal ownership of street railways, as represented in a proposal to bond the city of Seattle for $4,272,000, of which $1,172,000 was to be charged against the general funds of the city and the rest to be an indebtedness against 20 per cent of the gross receipts of the system when in operation, was defeated at a special election held Sept. 13. Out of a total of approximately 13,000 votes cast, municipal ownership lacked 935 of a plurality. Registration for the special election was 23,000. The weather was inclement, but the working classes voted heavily. It was proposed to build a municipal street railway system that would parallel and extend beyond the lines of the Seattle Electric Company.

Some little time before the election, Jacob Furth, president of the Seattle Electric Company, was asked for an expression of opinion as to the proposal. Despite his position Mr. Furth yielded to the demand, making some interesting comments. He is quoted as follows:

"I am somewhat embarrassed in expressing my views by the fact that I am the president of the Seattle Electric Company. However, those who know me are aware that I am able to speak for myself as a citizen and taxpayer, irrespective of the interests which I also represent. Without discussing the general question of municipal ownership, I do not think that the city can afford at this time to incur the indebtedness necessary to construct and operate the proposed system. The city has many urgent needs. We have not enough sewers, our water supply is inadequate, the municipal building must be completed, our fire protection in the business district is wholly insufficient. Besides these there are public improvements, such as grading and regrading streets, which must be carried forward without delay, and while it is true that the greater part of the most of these will fall upon the property affected, yet the immediate burdens on owners will be so great that the city should not add to them by unnecessary demands. This consideration, in my opinion, should be controlling upon the citizens of Seattle at this time.

"As for the Seattle Electric Company, it is waiting to see what the voters do at the special election. The company came into the field here when there were half a dozen or more independent and in many cases competing companies, most of which were in the hands of receivers. The service was poor. There was no transfer system. The equipments were run down. The company instituted a better service, replaced the worn equipment, built new lines, gave general transfers, and has done its utmost to keep pace with the growing demands of the city. In the outlying districts it has been a leader of population, not a follower. By reaching out to localities where land prices are low, often regardless of the fact that the new lines in the beginning were not profitable. it has made it possible for persons of moderate means to own their own homes in the suburbs and to get to their work conveniently, and has aided and made possible the development of large districts which otherwise would have remained unimproved. The company has prospered by this policy, and its policy in the future will be as it has been in the past.

"Some of the criticism of the company's service, in respect to overcrowding of cars, is justified. It has not been any more possible for the company to foresee all the extraordinary growth of the city than it has been for the city authorities, or men engaged in other enterprises. Orders for new cars and other equipment have to be given practically a year in advance, and often before the expiration of six months after the order has been given

it has become apparent that the provision was not sufficient. But this has been true in all departments of the city service. It has been true of the water department, of the sewer department, and in fact of all affected by the city's growth.

"Stone & Webster are the owners of about thirty properties in various cities. Their experience, resources, opportunities for purchase in large quantities on favorable terms, as well as their broad experience and liberal policy, have combined to render the Seattle service as nearly what it should be as the extraordinary conditions which I have mentioned would permit. The president and manager here have been accorded the most complete power in all matters of local concern—the business policy of the company is as much dictated by local conditions as if all of its stock were owned in Seattle."

SPECIAL CALL OF CENTRAL ASSOCIATION TO CONSIDER STANDARDIZATION

With a view of co-operating with the American Street and Interurban Railway Association in its work of standardizing equipment, the officials of the Central Electric Railway Association have called an informal meeting of the representatives of the mechanical departments of city and interurban companies, members of the association, to be held at the Aveline Hotel, Ft. Wayne, at 7 p. m., Sept. 26, the day preceding the next meeting of the association, for the purpose of making some definite recommendations to be presented at the national convention the week of Oct. 15, at Columbus, on the following subjects: Brake-shoes, journals and journal boxes, tread and flange of wheel, rails for interurban railways.

Members of the association are requested to come to this meeting prepared with data as called for by the standardization circulars which have been forwarded from time to time by the New York office of the American Street and Interurban Railway Association. E. W. Evans, superintendent of motive power of the Indianapolis Traction & Terminal Company, of Indianapolis, has been asked to preside at this meeting. Mr. Evans is a member of the engineering associations committee on standardization.

Secretary Merrill urges that every road represented in the Central Association have a representative of its mechanical department present at the Columbus meeting, prepared to take an active part in the discussion, and he also urges that as many as possible be present at the informal meeting at Ft. Wayne, which is called for the purpose of preliminary discussion and making of recommendations on the subjects mentioned.

POLICE REPORT ON CONEY ISLAND FARE TROUBLE SCORES PUBLIC OFFICIALS AND THE DAILY PRESS

Police Inspector Adam Cross's report to Commissioner Bingham on the recent fare disturbances along the Brooklyn Rapid Transit lines running to Coney Island has been made public. In it the Inspector blames an "inflammatory press" for "nearly all the trouble," and says, referring to Bird S. Coler, Sheriff Flaherty, Magistrate Higginbotham, and Highways Commissioner Van Vleck, that "the reprehensible attitude and unseemly interference" of these "gentlemen" who "butted in" was another reason for the trouble.

The Inspector reviews the occurrences along the Coney Island routes at length, beginning with the Gaynor decision on the five-cent fare question and relating, with detail, the happenings of Sunday, Aug. 12, the first day of the rioting. He says that the police were in a difficult position and that they arrested the railroad men wherever unnecessary force was used in ejecting a passenger. He tells of Coler, Flaherty and Van Vleck's visit to the scene; of the latter's using a wrench in an attempt to start a blocked car, and of his making a speech to the passengers advising them not to pay a second fare. Then he speaks of the Sheriff's appearance at King's Highway on the Tuesday, bent on seeing that the police protected passengers. He says that after Sheriff Flaherty had satisfied himself as to the manner in which the police were acting "he and his deputies absented themselves and disappeared from view." The Inspector's letter then says:

"It is no exaggeration to state that nearly all of the trouble that occurred can be attributed to an inflammatory press. The reports printed in some of the newspapers of assault and disorder were greatly exaggerated, misleading, and untrue."

As an instance, he says he and his men were charged with aiding and favoring the railroad. He emphatically denies that such was the case. The letter continues:

"To the reprehensible attitude and unseemly interference on the part of a number of gentlemen aforementioned, who tried to get into the limelight, who tried 'to butt in,' if I may be permitted to use the term; who endeavored to excite, by their inflammatory remarks and actions, the people to riot, presumably for the purpose of aggrandizing or gaining political prestige for themselves, is another reason why this controversy between the road company and its passengers reached such a serious aspect for a time."

TUNNEL AND "L" CONNECTIONS FOR NEW YORK BRIDGES

At the meeting of the plan and scope committee of the Rapid Transit Commission of New York last week, Chief Engineer George S. Rice laid before the committee his report on the proposed plan to build both an elevated loop and a subway loop. After the meeting Controller Metz declared that it now looked as if something finally would be done to relieve the intolerable congestion at the Manhattan end of the Brooklyn Bridge. He approved Mr. Rice's plan for a subway loop, but declared that the main thing was to give relief as soon as possible. If an elevated loop is built, he declared, it should be only a temporary arrangement, and a definite time should be set for its removal. The Controller declared that President Orr shared this view.

As contemplated in Mr. Rice's report the present elevated structure from the terminus at the Brooklyn Bridge as far north as Delancey Street would have to be constructed into a double-decker, with the main lines on the lower tier and the loop lines on the upper. A new station would be built at Delancey and Allen Streets and at Park Row and Duane Street. The total cost of the improvement, including damage to abutting property, is estimated at $3,500,000. The cost of the various loops and connections is estimated at $16,080,000.

The estimates for the various proposed subway connections are as follows:

BOROUGH OF MANHATTAN

A four-track subway from the Williamsburg Bridge terminal, which is now under construction, to the Brooklyn Bridge	$3,400,000
Changes of Brooklyn Bridge approach to connect with subway	750,000
A two-track subway from the Brooklyn Bridge through William Street to a point north of and near Wall Street	700,000
A two-track subway on Grand Street and Desbrosses Street from Centre Street to Washington Street	1,530,000
A two-track subway in Liberty Street and Washington Street from William Street to Desbrosses Street	2,100,000
A two-track subway in Washington Street from Desbrosses Street through Greenwich Street, Ninth Avenue, Fourteenth Street, University Place, Washington Square East, Wooster Street and Canal Street to Centre Street	5,600,000
Easements (estimated)	2,000,000
Total	$16,080,000

BOROUGH OF BROOKLYN

A two-track connection from the elevated tracks on the Williamsburg Bridge to the subway at the intersection of Bedford Avenue and Broadway	420,000
A four-track subway in Bedford Avenue and Bedford Avenue extension, from Broadway to Lafayette Avenue	2,520,000
A four-track subway in Lafayette Avenue from Bedford Avenue to Fulton Street	2,050,000
A four-track subway in Fulton Street from Lafayette avenue through Flatbush Avenue extension, Willoughby Street and Fulton Street to Myrtle Avenue	1,830,000
A two-track connection from the subway at Myrtle Avenue and Fulton Street to the elevated tracks on the Brooklyn Bridge	410,000
Easements (estimated)	200,000
Total	$7,430,000

CLEVELAND'S LOW FARE FIGHT

The Cleveland Electric Railway Company has filed a petition asking the Supreme Court to advance the Reynolds suit for an early hearing. The suit was brought in the Common Pleas Court originally. It attacked rights of the low-fare company on Dennison Avenue, the first street upon which the low-fare obtained a grant, on four grounds, viz.: that a small portion of the projected route was outside of the city, preventing free bidding; that the $10,000 cash deposit required was too heavy and hindered free bidding; that the successful bidders were required to give free transfers, thus placing an unequal burden upon the Cleveland Electric, and that the City Clerk neglected to advertise three weeks for bids.

The lower court held that there was some doubt as to the legality of the grant on two counts, but held for the Forest City Company in the main. The Circuit Court decided wholly for the low-fare company. The case, under ordinary conditions, would not come up for two years. If the Cleveland Electric should win this case, it would mean not only the loss of the Forest City Company's grant on Dennison Avenue, but on nearly all other streets where it has obtained grants, because the later grants have all been made as "extensions" of the original route in order to prevent competitive bidding.

The Central Avenue franchise for the Forest City Company was to have been passed Monday evening, but was not brought up. It appears evident that the old company is the victor for the time being, at least, in the battle for consents of owners of this street, which is one of its most important arteries; otherwise the ordinance would have been put through.

ANOTHER EFFORT AT INTERCHANGE OF TRAFFIC IN THE WEST

D. G. Edwards, traffic manager of the Schoepf properties in Ohio and Indiana, has for some time past been negotiating with leading steam road officials relative to an interchange of business between the lines in this important traction system and the steam roads of the Central Passenger Association. Heretofore the Central Passenger Association has declined to recognize the tractions or do business with them, although several of the roads have individually made alliances with electric roads, much to the displeasure of some of the other roads whose business was affected by the arrangements. Mr. Edwards is an old steam road man, having formerly been traffic manager of the Cincinnati, Hamilton & Dayton Railroad (steam), and he has strong influence among the steam traffic men. One of the chief objections of the steam people to doing business with the electrics in the past has been the excuse that some of the electrics were not financially responsible. This objection is, of course, removed in the strong system representing something like 1500 miles over which Mr. Edwards has charge of traffic. There has also been the objection that the rates of electrics were lower than those of steam, and that such an alliance would result in many conflicting rates between certain points. Since the adoption of the 2-cent fare law in Ohio this objection has been practically removed in that State, and the rates are now substantially the same. At the meeting of the Central Passenger Association, to be held in Chicago this week, the committee appointed to confer with Mr. Edwards will make its report and recommendations, and the outcome of this meeting will be watched with considerable interest by all steam and traction men of the district.

SECRETARY MERRILL AN EMERGENCY MAN

J. H. Merrill, secretary of the Central Electric Railway Association, is demonstrating that his office of salaried secretary can be of value to the various roads in the association in more ways than those contemplated when the office was created. Aside from his routine work of preparing tariff sheets for governing interline passenger business, and of compiling and promulgating information and statistics of different kinds, he has recently been of assistance to some of the roads where information and quick action were required. For instance, a road in Ohio needed a number of extra cars on short notice to handle a big excursion. They could not be secured nearby, and as a last resort the manager telephoned to Mr. Merrill to see if he knew of any Indiana lines that could help him out; a few minutes telephoning to various roads radiating from Indianapolis soon had the desired rolling stock on the way to the Ohio manager. Another Ohio road had an accident, in which several Indiana people were injured. The matter of making adjustments with these people was placed in the hands of Secretary Merrill and the claims were quickly settled on a basis satisfactory to the company. Frequent visits among the various roads, and his wide acquaintance with operating practice and conditions in all parts of the district, have enabled Mr. Merrill frequently to supply information along certain lines, which has been of great convenience and value to the manager making the inquiry.

OHIO INTERURBANS COME UNDER SUPERVISION OF THE RAILROAD COMMISSION

The Railroad Commission of Ohio, appointed a few weeks ago acting under the Wirtz law, passed by the last Legislature of that State, has extended its supervision over electric railways, and in the future will require them to make the same reports and to follow practically the same regulations that have been required of steam roads in the past. Representatives of the Commission have already made thorough investigations of two or three wrecks which have occurred on Ohio interurban roads within the past few weeks. The Commission has decided that it wlll not attempt this year to require the interurban roads to make the same detailed reports of equipment, earnings, operating expenses, employees, etc., that is required of the steam roads, because these reports are due within a few weeks, but it will shortly call a meeting of Ohio interurban operators to devise plans for more uniform regulations and schemes of operation. The Commission will take up the question of safety devices on traction lines, and will require the roads to make reports of all accidents immediately.

It is also understood that the Commission will investigate the passenger rates charged by some of the interurban lines. The Commission holds that its jurisdiction extends to the electric roads in the matter of rates as well as in other matters. It is known that in a few instances where interurban roads do not have the competition of steam roads, they have always charged more than the 2 cents a mile rate which was prescribed by the last Legislature. It has been claimed by these roads that the 2-cent law referred only to the steam roads and that therefore they do not come under the province of its rule and there may be some controversy on this point.

ANNUAL MEETING OF THE ALLIS-CHALMERS COMPANY

The annual meeting of the stockholders of the Allis-Chalmers Company held in Jersey City, Sept. 6, was marked by an unusually large attendance, more than 65 per cent of the entire capital stock being represented. The re-election of W. H. Whiteside to the presidency, and his election to the directory to fill the longest term in the gift of the company, assures a continuance of his aggressive policy. It is noticeable that the company has secured about $4,500,000 worth of orders for classes of machinery not hitherto manufactured by the company, and this amount would have been very largely augmented had the completion of the improvements and extensions of the West Allis plant not been delayed by the labor troubles to which the contractors erecting the new buildings have been subjected. Notwithstanding the fact that the volume of orders taken for Allis-Chalmers steam turbines has been beyond all expectation, the demand for Reynolds Corliss engines also shows an unprecedented increase over preceding years. In the electrical field the large orders received have hastened the occupancy of the new shops at West Allis provided for this branch of the business, which, in spite of their unfinished condition, are already in partial operation. Some of the largest corporations in the country have awarded the Allis-Chalmers Company contracts for their complete power and electrical equipments, thus endorsing President Whiteside's policy in providing the new departments established during the past year, which now enables the Allis-Chalmers Company to take orders for complete installations and thereby save purchasers the losses and annoyance incident to the division of responsibility in the erection and operation thereof. The acquisition by the company of the Christenson air brake and compressor patents rounds out the list of products required to enable the Allis-Chalmers Company to enter the electric railway field fully equipped for that service.

ILLINOIS TRACTION TO ENTER ST. LOUIS

The Illinois Traction System will bring its passenger and freight cars into St. Louis by transfer in sixty or ninety days, arrangements having been made with the Venice Terminal Company and the Madison County Ferry Company for the Illinois company's cars to cross the tracks of these two companies at Venice, and for the cars of the two companies to cross the Illinois company's tracks. The Illinois Traction System is now laying tracks at Venice, and proposes to have the road completed to the ferry landing in sixty or ninety days. The company has a frontage of 3600 ft. on the St. Louis levee in the vicinity of Salisbury Street, on land embracing 24½ acres, and it is enabled to enter St. Louis without operating its cars over the Merchants' Bridge. However, the plan of entering St. Louis on the Merchants' Bridge or the proposed new municipal bridge has not been abandoned. The company will finish its construction in East St. Louis by Jan. 1. It is now operating between Venice and Springfield, between Decatur and Bloomington, from Staunton to Litchfield and Hillsboro and between Danville and Champaign. Construction is under way between Champaign and Decatur, between Bloomington and Peoria and between Springfield and Lincoln, and all of these lines will probably be completed by Jan. 1. Work will be started early next year on the line, 30 miles long, between Springfield and Jacksonville.

SAN FRANCISCO SITUATION

After the eleven days' strike of the carmen of the United Railroads of San Francisco service was resumed as usual on Sept. 6, and has been continued since. The differences between the men and the company are to be settled by an arbitration board. As members of this board the United Railroads has selected Thornwell Mullally, assistant to the president, and the men, Richard Cornelius, president of their organization. The neutral arbiter has not been chosen yet, as some difficulty is being found in selecting a man who will be satisfactory to both sides. In all probability a judge of the local bench will be chosen. Meanwhile the United Railroads has declared itself for an open shop on its system, President Calhoun stating that he would discharge no efficient workman who wished to remain in his employ simply because he was not a member of a union. The men assume that this point will be arbitrated. A. L. Worthington, president of the Pacific Council of Electrical Workers, who has been foremost in the events of the last few days, has been chosen by the men as arbiter for all the workmen outside of the carmen. Track construction and reconstruction will be carried on as rapidly as possible. All building work of a permanent nature, however, will be postponed until the labor conditions reach a more stable and satisfactory basis. Among the improvements contemplated are new car houses, shops and sub-stations and a $1,000,000 central office building to house all the offices of the company.

INCREASE IN PAY FOR SURFACE CAR EMPLOYEES IN NEW YORK

The employees of the New York City Railway Company were voluntarily given an increase in pay, effective Sunday, Sept. 16. The new schedule provides that first-year motormen shall be increased from $2.10 a day to $2.25 a day; second year, $2.25 to $2.35; third, fourth and fifth years, $2.35 to $2.45, and after five years $2.50 to $2.60. The pay of conductors in their first year's service will be raised from $2.00 to $2.15; second year, $2.15 to $2.25; third, fourth and fifth years, $2.25 to $2.35, and after five years, $2.35 to $2.45. There are about 8000 men affected by the order. This includes every electric line in Manhattan, whether of the original Metropolitan Street Railway, a leased line or one operated by the company. The increases will aggregate from $700 to $800 a day, which will make the total increases in a year from $250,000 to $300,000.

Mr. Root, vice-president and general manager of the company, said:

"There are two reasons for this action. The first is that we wish to recognize the services of our men, and do recognize and appreciate them exceedingly. The second is that we wish to get the best men possible. And I think we have them. We are already paying higher wages than any other street railroad in this country, and by the new move will go still further. We wish to attract the best class of men, and the best wages will surely bring them."

TRIALS OF SPEED IN OHIO

As a rule, the managers of Ohio interurbans are adverse to high-speed contests or races with steam railroad trains, but occasionally there are exhibitions which demonstrate the astonishing speed powers of some of the interurban roads when cars have a clear track. There have been several demonstrations of this kind of late, which did not get into the daily print.

J. B. Foraker, Jr., of the Schoepf syndicate, tells of a little ride he recently took on the Ft. Wayne, Van Wert & Lima. The motorman on this line, which closely parallels the main line of the Pennsylvania, claim to have run away from or stayed alongside of every passenger train on the line, except the Pennsylvania special, the 18-hour train between New York and Chicago, which goes through very early in the morning. On this occasion they pulled onto straight track outside of Lima just as the flyer came along. For a few seconds it looked like an easy thing for the famous train, but after the big interurban got under way, she ran neck and neck with the special for more than 25 miles when a slow-down for a town allowed the flyer to get away. It was described as a wildly exciting burst of speed.

Superintendent Bradley, of the Scioto Valley, tells of a little trip on his road, which demonstrated the speed of his cars. A surgeon was wanted for a wealthy patient at Chillicothe, and the company was asked to get him there as quickly as possible. The car left Columbus station at 12:55 a. m. and didn't exactly observe the speed ordinance going out of town and arrived at Chillicothe at 1:59, 1 hour and 4 minutes for 49 miles, including 3 miles on city tracks and five stops for railroad crossings and passing points.

The Lake Shore Electric tested out one of its two-car limiteds with train operation one night recently and reached a speed of 71.1 miles an hour for a short distance.

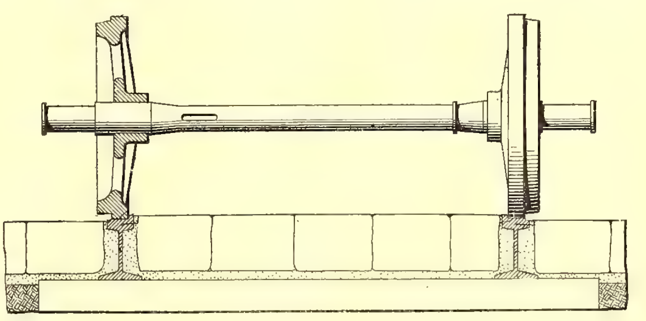
STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED SEPT. 11, 1906

830,568. Trolley Controlling Apparatus; Frank E. Case, Schenectady, N. Y. App. filed March 10, 1905. Pneumatic cylinders are provided for withdrawing the contractor shoe or the trolley from their operative positions as desired. The two cylinders are respectively under the control of the engineer's valve.

830,623. Rail; George B. Taylor and Constantine B. Voynow, Philadelphia, Pa. App. filed Feb. 17, 1904. Comprises a rail provided with a relatively broad and thick tread symmetrically disposed with relation to the plane of its vertical web and to the



PATENT NO. 830,623

cross-section of its base and having a lateral, retaining flange extending along one edge of the tread.

830,647. Vestibule Curtain for Cars; Samuel M. Dawson, Kansas City, Mo. App. filed March 6, 1906. In order to prevent the vestibule curtains from being torn when two cars separate, the patentee has a yielding catch which is tripped by a band connection whenever the cars separate to a predetermined amount.

830,686. Trolley Pole Controller; John J. Tartt, Los Angeles, Cal. App. filed Dec. 28, 1903. A solenoid magnet is connected to retrieve the trolley pole when energized by a special circuit completed by the movement of an upper pivoted section of the trolley pole whenever the latter leaves the wire.

830,733. Multiple Speed Railway; Leslie McHarg, New York, N. Y. App. filed June 18, 1904. A moving sidewalk platform has a number of rails on each side which have such a relative move-

ment and co-operate in such a way that straight rails are used when the platform is traveling in a direct line and curved rails when it is turning a corner.

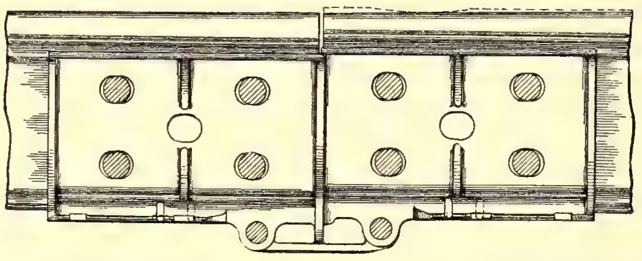
730,748. Fare Register Operating Device; Joseph A. Stone, Arlington, N. J. App. filed April 7, 1906. A shaft extends centrally in a longitudinal direction through the car and has lever arms on both sides for ringing up cash and transfer fares. Has slotted link connections with the respective registers.

830,791. Removable Handle for Fare Registers; William G. Kirchhoff, Chicago, Ill. App. filed June 16, 1905. Mechanical details of an adjustable handle applicable to a longitudinal shaft in a car. It is designed to be firmly positioned at any point on the shaft.

830,847. Rail-Joint; Arthur L. Plimpton, Boston, Mass. App. filed June 9, 1905. The process of repairing rail-joints, which consists in raising the worn rail, removably holding the same in raised position and cutting down its tread.

830,867. Extension Car Step; Benjamin Watson, Eden, N. Y. App. filed Dec. 29, 1905. The lower step is fixed to downwardly slidable rods, which are depressed by a foot pedal on the platform, and held in such relation by a detent against spring pressure.

830,922. Car Construction; Allen E. Ostrander, Paterson, N. J.



PATENT NO. 830,847

App. filed Jan. 10, 1906. Details of a steel frame car construction including the disposition of the vertical posts and diagonals with respect to the window openings.

830,940. Steam Motor Car; William G. Wagenhals, St. Louis, Mo. App. filed May 18, 1906. A steam engine for branch lines adapted to carry passengers and freight. Constructed like an ordinary dummy engine except the engine is on the bogie trucks and has swivel connections with the steam supply pipe.

831,025. Locomotive Engineer's Alarm; Edward McClintock, Merriam Park, Minn. App. filed May 16, 1904. Special conductors are laid adjacent the usual track rails and trolleys on the locomotive depend into continuous contact with the conductors. A special form of controller in the locomotive cab is effective to throw signal devices or telegraph instruments into circuit as desired.

PERSONAL MENTION

MR. GEO. W. PEIRCE has resigned as manager of the Stamford & Port Chester division of the Consolidated Railway of Connecticut, because of ill health.

MR. F. W. HAMLIN has been appointed master mechanic of the Eastern Ohio Traction Company. Mr. Hamlin was formerly train master with the Columbus, Delaware & Marion Railway.

MR. EZRA E. SAVAGE, for a number of years superintendent of the Dedham & Franklin Street Railway, has resigned from the company to take up residence in Union, Me. Mr. William E. Gardner, who has been connected with the company in a clerical capacity at Westwood, has been appointed to succeed Mr. Savage.

MR. FRED. S. BERRY has been appointed superintendent of the Orange County Traction Company, Newburgh, N. Y. Mr. Berry was connected with the Staten Island Midland Railroad Company for fourteen years, and during the latter part of this time he was assistant superintendent. For the past three years he has held the position of train despatcher on the road of which he is now superintendent.

MR. DANIEL O'DAY, prominent in Standard Oil affairs for many years and a figure in financial circles, died Thursday, Sept. 13, at Royan, in the South of France. Mr. Day was in one way or another connected with the following electrical corporations: Niagara Falls Power Company, International Railway of Buffalo, Buffalo General Electric Company, Cataract Power & Conduit Company, Venanga Power & Traction Company.

MR. CARL J. KIEFER has resigned as chief engineer of the Cincinnati, Milford & Loveland Traction Company. and has become associated with the Reliance Engineering Company, consulting and contracting engineers, of Cincinnati, Ohio, which makes a specialty of power and lighting plants and interurban electric railways. Mr. Kiefer had charge of the designing and building of the power station, sub-stations and road of the Cincinnati, Milford & Loveland Traction Company.

MR. ARTHUR W. FIELD, who formerly represented the Peckham Manufacturing Company at Boston, has been appointed general sales agent of the Standard Motor Truck Company, of Pittsburg, Pa. This company has been manufacturing double and single electric car trucks during the past three years under the name of the Standard Steel Car Company, of Pittsburg, Pa. The car company is said to have the largest plant for the manufacture of steel cars in the world, and is controlled by the same interests identified with the Standard Motor Truck Company.

MR. EDWIN JOWETT, for eight years chief engineer of the South Chicago City Railway Company, has recently accepted the position of assistant chief engineer at the Fisk Street plant of the Commonwealth Electric Company, Chicago. Mr. Jowett, whose record as a steam and electrical engineer is very enviable, is actively in charge of the operation of the plant, which is said to be the largest of its kind in the world. The generating units are Curtis-General Electric turbo machines, one of these which has just been installed having a capacity of 8000 kw, probably the largest single unit now in use. Mr. Lawrence W. Robinson, who was one of Mr. Jowett's assistants for more than seven years at the South Chicago plant, has been promoted to engineer in charge at the latter place.

MR. JOHN J. GETTINGS, division superintendent of the Springfield Avenue, Kinney Street and Plank Road lines of the Public Service Corporation, has been appointed superintendent of division No. 3, in which position he has charge of all lines in the section embracing Elizabeth, Westfield, Plainfield, Rahway, Perth Amboy and New Brunswick. Mr. Getting's old place has been halved, and Mr. John McCarthy, for the last nine years chief inspector at Market and Broad Streets, is now division superintendent in charge of the Plank Road line, while Mr. Joseph Sturm, who has been conductor and starter and more recently day depot master at the Plank Road car houses, has been promoted to division superintendent in charge of the Springfield Avenue and Kinney Street lines. Mr. McCarthy has been succeeded by Mr. William Dowling, who was his assistant. The Central Avenue line, hitherto operated in combination with the Orange Street line, is now a division by itself, with Mr. H. Valentine, for seventeen years a conductor and more recently depot master at the Central Avenue car house, in charge, with the title of division superintendent.

MR. RICHARD S. BUCK, M. Am. Soc. C. E., consulting engineer to the Department of Bridges of New York City, had recently become a member of the firm of Sanderson & Porter, of New York, the partners now being Messrs. Edwin Sanderson, H. Hobart Porter, Francis Blossom, Richard Talbot and Richard S. Buck. The firm's operations embrace all lines of civil, mechanical and electrical engineering, and it has designed, constructed and operated steam and hydro-electric power plants, railways and lighting properties in various parts of the country. Among its works now in hand may be mentioned 50,000 hp of hydro-electric work in two developments on the Pacific Coast; the power-house equipment and transmission system of the McCall Ferry Power Company on the Susquehanna River; extensive additions to the New Orleans street railway and lighting properties, and to those of the Mahoning & Shenango Railway & Light Company, of Youngstown, Ohio, and New Castle, Pa. Mr. Buck, the new member of the firm, was graduated from the Rensselaer Polytechnic Institute in 1887, and served on river and harbor works under officers of the Corps of Engineers, U. S. A., for some years. He then became general manager and engineer of a company engaged in mining phosphate rock in Florida, but left this work in 1893 to enter the field of structural steel design, fabrication and erection. His work in this specialty is too well known to need extended review here, for he has been identified in very responsible positions with several of the great bridges over the Niagara River and the East River and has also been the chief engineer of the Dominion Bridge Company.

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Of this issue of the Street Railway Journal, 8000 copies are printed. Total circulation for 1906 to date, 318,500 copies, an average of 8167 copies per week.

Purchased Power for Street Railway Service

The question of buying power from outside sources is an occasional problem in street railway service, and when it arises it deserves very careful consideration, especially if the distribution proposed is in connection with a hydro-electric generating plant. Experience at Buffalo, Montreal, and in the Far West especially, shows how unwise it is to generalize hastily upon the power question, when it comes to a stand-off between water power and local steam generation. Fixed charges and operating expenses need to be figured cautiously before one can decide whether a power contract will be advantageous or not. The opinion is widely held that a company can generate its own power more cheaply than it can buy, except in the case of a water-power installation, and while this is generally true with careful management, the question is always worth considering.

Within the past five years there has been a pretty general reduction in both lighting and power rates on the part of central stations and large power companies. In the campaign to increase business by bringing the commodity sold nearer to the average consumer's purse, the telephone companies have reaped a remarkable harvest of added gross earnings, and the same general movement is now visible in the central station field. Consumers of large blocks of power are given rates in many cities considerably below 3 or 4 cents per kw-hour, and in a good many cases a 2-cent rate appears from an analysis of the monthly bills. Now there is little doubt that a very well-operated steam plant can turn out power at a cost not much in excess of 1 cent, including fixed charges, but it is also true that on a large number of systems the cost of each kilowatt-hour is considerably in excess of this figure. We often see figures representing the operating cost of turning out electrical energy, including fuel, labor, maintenance and supplies, but figures accounting for fixed charges per unit of output are by no means common. No one knows what his actual power cost is unless these stand-by expenses are footed up, with a goodly allowance for depreciation. A 5000-kw steam plant may produce a kilowatt-hour at an operating cost of 0.7 cent, but if we allow 5 per cent interest, 8 per cent depreciation, 1 per cent for taxes and 1 per cent for insurance, the fixed charges easily amount to $75,000 per year—by no means an insignificant sum to be pro-rated upon the units of output. If we assume a 40-per-cent load factor upon continuous day and night operation the average load will be 2000 kw, which means a fixed charge of about 0.4 cent, and brings the actual power cost up to 1.1 cents. This is coming perilously close to the minimum power rate found even in small hydro-electric transmission systems. With a gas-engine plant the small street railway is likely to do as well in generating its own power as it can do by purchasing it, for the load factor is apt to be wretched in a small railway station and the demand for energy excessively uneven, though too small in volume to command minimum rates.

Even on a large system the cases are few where absolute dependence upon water power is advisable. Few things are more variable than the available water supply of a hydro-electric system, valuable as such power is when it can be developed. Continuity of service is an absolute necessity in a transportation system, and for this reason the practice of supplementing the regular plants by a hydro-electric supply is an excellent one, as is the opposite plan of installing steam or gas auxiliaries. There is very little doubt that steam

power can ordinarily be generated at less expense in a skilfully managed and good-sized railway plant than it can be purchased from a steam-driven station, but there are cases, even in the practice of large companies, where the reserve power of a local central station supply may be worth having. The winter peak is sometimes too great for the existing capacity of the system without outside help, or again, greater reliability may be essential in the congested district. The power question is a very broad one, and cannot be disposed of in a few paragraphs; no question is of more technical importance than this at the present time in electric railway practice. It is a great mistake to decide off-hand that purchased power is too costly for use under any ordinary circumstances, but it is equally hazardous to assume that the bed rock of power cost has been reached in one's own plant, in view of the progress which is to-day occurring in the field of power generation and distribution. Careful figures for each specific case are the only determinants of the problem as regards future action.

Railway Networks

The editorial space available in our issue last week did not allow us to comment on Prof. Rasch's excellent paper before the Milan convention, published in the last issue. Electric railway networks in this country at least are rather spontaneous growths than deliberate structures, so that it is rare to find any systematic following of the principles of network design. Most large systems have come to be combinations of open and closed networks, the outlying members being of the former class and the closed elements being a natural outgrowth of an extension of the feeding system. Obviously the system most economical of copper is a complete inter-connected network involving both working conductors and feeders. The main objection to such a system both in electric lighting and in railway work is the extent to which a single fault may involve the whole system and the difficulty of isolating, when necessary, a part of the system. Thus in alternating-current systems a closed primary method which is extremely desirable in holding the voltage uniform over a large area is rarely employed, one of the chief reasons for avoiding it being the difficulty of obtaining and maintaining high-tension junction switches of adequate capacity. Switches for railway service are easily enough obtained and operated, but the large amount of trolley wire in service implies a probable frequency of short circuits far in excess of anything found in lighting systems. A large plant is able to pull through or to burn out any but very severe faults. This immunity does not extend to plants of medium size which, unless the network is well equipped with circuit breakers, may be practically shut down by the fall of a trolley wire.

Prof. Rasch's suggestion of putting rather a small amount of copper in the trolley wires, and sectionalizing them so as to limit the zone of distribution of each of the feeding-in points is a very sensible one in cases where excessive service is unlikely to be concentrated on sections thus constituted. It is the load-wandering that is the source of most of the electrical troubles on electric railways. With such arrangement of feeders and working conditions it ought to be possible to use automatic cutouts with good success, although in this country hand switches are more freely used. In a big railway system with rather dense traffic hand switches and men to operate them will be frequent enough to take care of most troubles promptly, and, as already stated, the plant is likely to stand up relatively well until help comes. We note, however, that few of the large foreign systems use hand switches, and that the sentiment in favor of automatics is growing. On railways covering considerable territory without heavy enough generating equipment to pull through troubles readily, the use of automatic circuit breakers in the sectionalization of the network is very important. If laid out along the lines suggested by Prof. Rasch, which are not infrequently followed already, the setting of the breakers to isolate trouble is not a matter of particular difficulty. The chief point is to so arrange the sections that normal overload caused by exceptionally severe traffic will not open the breakers. In other words, the working conductor should be so proportioned that a short circuit caused, for instance, by the fall of the trolley wire on the track will be considerably more severe than the worst probable overload and so will open the breakers on that trolley section.

The device of shunting switches and circuit breakers by lamps is effective in locating the scene of trouble, and after all even without these the dead section discloses itself only too promptly. The main difficulty with the closed network, or open network for that matter, having automatic cut-outs, is the blockade that may result incidental to the electrical trouble, and this is up to the repair crew. It strikes us that this is the practical limitation of service irrespective of the network. The immediate effort of a heavy short circuit on a system with somewhat limited generating capacity is paralysis of the service near the point immediately affected, plus practical disability everywhere else. If the short circuit is removed either by clearing the wire or by cutting out the section the widespread effect is also removed, but the local service is still interrupted until temporary repairs are effected. The value of automatic circuit breakers lies in the promptness with which the local effects are isolated. Its danger is in the chance that the circuit breakers may overdo their good work and isolate a much larger area than is necessary, thus delaying the resumption of traffic. This difficulty may be remedied by suitable adjustment of the breakers, as Prof. Rasch has indicated, and also good may be derived from the use of delayed-action circuit breakers at the more important junctions so as to render more certain the isolation of the affected section by its own proper apparatus. Or for that matter if the working conductor is thoroughly protected automatically, the more remote risk of trouble on the feeders may be taken care of by hand switches, chiefly useful in isolating certain areas in case of fire, when traffic would generally be checked anyway. No hard and fast rule can be laid down for network construction, which depends for its success on close knowledge of the operating conditions. That the principle of closed networks is as a whole sound a simple reckoning of the feeder copper will soon show. So far as the network feeders can be controlled from the station the problem is a simple one. The cross connections are more difficult, but in many systems are essential to economical feeding, and should not be neglected. It is fortunate that in big urban systems, where the load-wandering is most severe, the difficulties of network operation are diminished, owing to the usual closer inspection, the free use of telephone connections,

and the large generating capacity. For the rest the matter should be treated cautiously and systematically, and the safety devices located where they will be most accessible.

More Evidence on Braking

The evolutionary cycle in electric railway apparatus at home and abroad, to which we have had occasion to refer in previous issues of this paper and which has had many examples, is again prominently shown in the case of braking apparatus for cars. It may have been simply a curious coincidence that upon the very week that the New York street railway managers were discussing the subject of brakes in Albany the executive officers of the European Continental roads had the same topic as one of the principal features of their Milan meeting. On the other hand it may have been an illustration simply of the tremendous importance of this question of stopping the car—secondary only to putting it in operation—and of its still somewhat unsettled condition which compelled its extended consideration at the same time by two representative street railway bodies in the two hemispheres.

The report of the Milan convention is not yet available, but a comparison of the papers presented on braking at that convention and the papers and discussions at the Albany meeting last week offer striking points of dissimilarity. The European papers are devoted to a discussion of the relative merits of air and electric brakes. The Albany discussion was largely a defense of the hand brake and a definition of its place in the equipment of electric railway cars. The brake referred to, however, was not the old-fashioned hand brake of horse-car days, with a spindle shaft to which the brake chain was attached by a single bolt, but the improved hand brake by which the power of the motorman's arm is multiplied by mechanical methods and in which the danger of the chain parting from the staff is eliminated.

The Albany meeting commenced with a discussion of the relative merits of the single vs. the double brake chain, a subject upon which the Board of Railroad Commissioners had requested the sense of the association, but incidentally all methods of braking, especially hand braking, received considerable attention. The experience of Buffalo, Albany, Jersey City, Detroit, Montreal, Schenectady and Syracuse, as developed at the meeting, seemed unmistakably to be that the improved hand brake was sufficient and in some respects superior to a power brake for light cars at slow speeds, and that it was essential as an auxiliary to the heavy high-speed cars which also carried an air or other power brake. Opinions differed as to the size, weight and speed of the car which should be controlled by the more powerful apparatus; one would confine it to double-truck cars, another to cars 27 ft. over all or longer, while a third thought that it had no place on any city car. No one questioned the necessity of the power brake for heavy high-speed service or that it was per se objectionable for city service. But the tendency of the motormen to interfere with its proper working and to make spectacular or "grand stand" stops, as well as its maintenance charges, were the principal claims brought against it. On the other hand evidence was presented that in some cities, at least, the hand brake was considered safer than the air both against liability to injury and so far as accident to pedestrians is concerned, and that the motormen prefer the hand brake as a matter of protection to themselves.

In the meantime the air brake, magnetic brake and electric brake, which in all of their most popular forms were originated in this country, were being eulogized by European managers, among whom power braking, even for cars weighing as low as 7 to 8 tons, seems to have been taken up actively and spontaneously, and to have grown in advance of municipal requirements. Looking at the statistics of the subject in a somewhat cursory manner, the first thing to strike one is the great vogue of electric brakes on the European railways and the freedom with which they are employed on comparatively light cars. For instance, of 8390 motor cars between the weights of 8 to 10 tons 5318, or a little over 64 per cent, were equipped with electric brakes. In addition 1376 more cars between 5 and 8 tons weight had such brakes, and with 142 companies reporting on the subject and operating in all 14,563 cars, just half the cars used electric brakes. On the other hand, only 15.6 per cent of the cars were fitted with air brakes. For cars over 10 tons in weight, however, the air brake seems to be generally the favorite, outnumbering its electric rival more than two to one. Of course, the relatively small cost of the electric brakes, at least in their simpler forms, in part explains these figures, but withal it seems clear that our foreign friends seem to prefer electric braking on its merits. It is significant, however, that for heavy high-speed cars the choice falls upon air brakes, whether from their independence of the current supply or from greater operative reliability it is difficult to say.

Data on the power required by the two classes and upon the cost of their maintenance are difficult to obtain. There is evidence of lessened energy per car-mile in favor of the electric brake, but it is not altogether conclusive, owing to the general use of the air brakes for heavy service. On the other hand, nearly half of the companies using electric brakes complained that the system was hard on the motors and caused severe depreciation of gearing and controllers. As several varieties of such brakes are in use it is difficult to say whether the troubles reported have a general or specific cause. Improper control, or improper use of control in electric braking may be responsible for very serious difficulties. In spite of what has been done toward semi-automatic control of braking the fact remains that in the last resort the results depend on the skill and judgment of the motorman. This was clearly brought out at the Albany meeting, where the evidence seemed to be that too great power was a detriment with light or slow-speed cars. On the other hand, as one of our correspondents recently intimated, while an improved braking system does not necessarily decrease the number of accidents, it permits heavier cars and better speed.

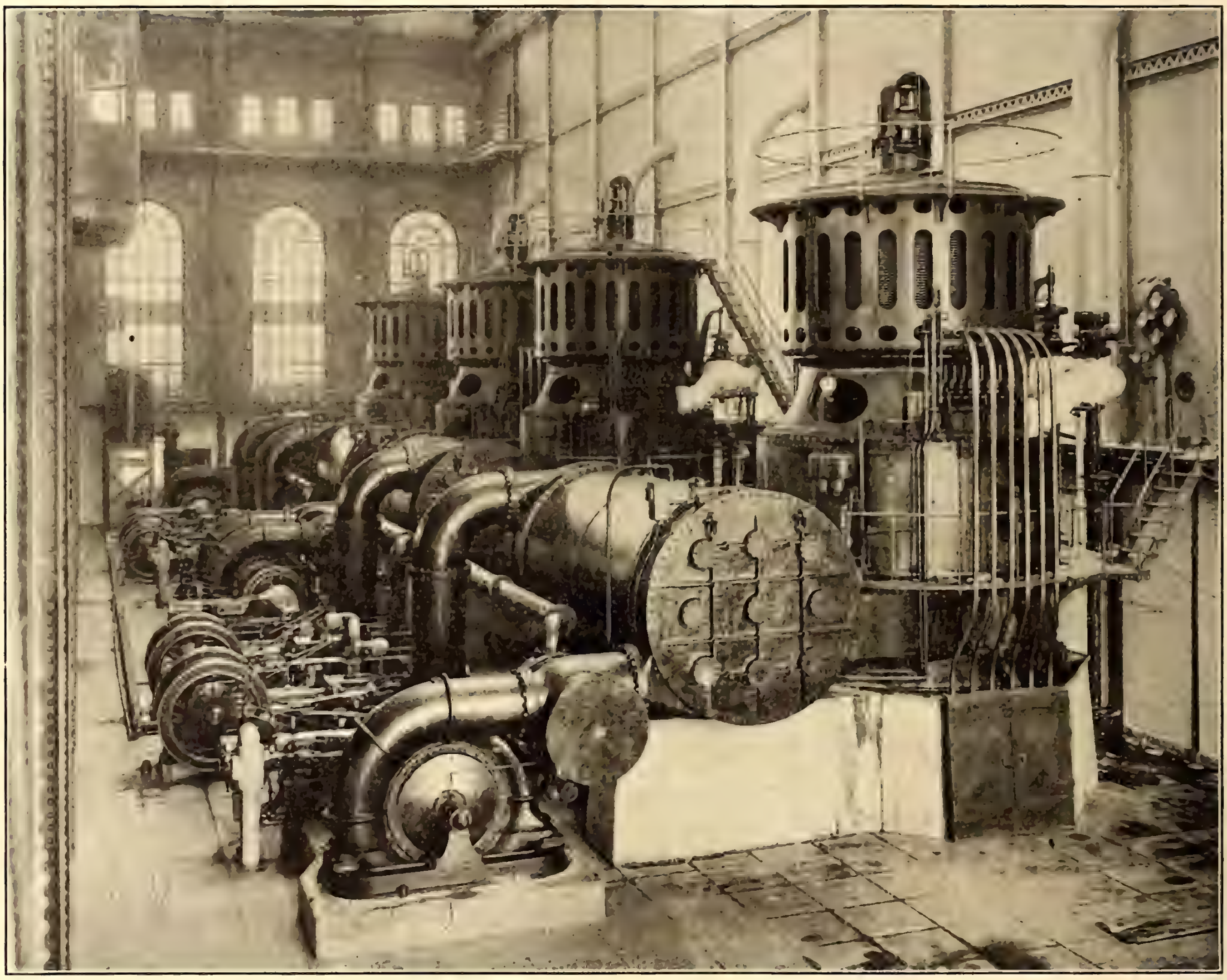
In this connection, we hope to see electric braking given a larger opportunity in this country than heretofore, since experience abroad certainly indicates that it has a useful sphere of action. American electric cars are on the average heavier and faster than those abroad, and it is natural to suppose that air brakes would be more freely used here than there, without going into the details of comparison with electric brakes. Nevertheless there must still be many places where with light cars the electric brake would have an opportunity for usefulness as an auxiliary to the hand brake. It is evident enough that fairly satisfactory brakes of this type are in so common use abroad as to prove their practical economy and desirability.

THE PORT MORRIS POWER STATION OF THE NEW YORK CENTRAL RAILROAD

In the STREET RAILWAY JOURNAL for March 11, 1905, an account and plans were published of the Port Morris and Yonkers electric power stations of the New York Central & Hudson River Railroad. Since that time work has been progressing rapidly both on the stations and on the remainder of the electrification, and during the latter part of October, or early in November, the company expects to make the anticipated change in its motive power from steam to electricity in the initial electric zone south of High Bridge and Wakefield. The work incident to this change has progressed to such a point that were it not for new signals and the abnormal passenger traffic in the early autumn, the change, so far as motive power is concerned, could be made early in October.

As stated in the previous article, the electricity to operate the cars and locomotives will be generated in two power stations; one at Yonkers on the Hudson River, and the other at Port Morris on Long Island Sound. These two stations have capacity enough and to spare for the ultimate electric zone, which will extend to Peekskill on the Hudson division, and to North White Plains on the Harlem division. The Port Morris station is now in operation, but the Yonkers station will not be completed for some months. The Port Morris station, however, has ample capacity to operate the initial electric zone, and the four sub-stations for this zone are practically in readiness, so that electric service by the time specified is assured.

The Port Morris and Yonkers stations will be almost duplicates, and although they embody no radical departure from recognized practice, each is an excellent example of modern engineering. The station sites, besides being near the load centers of the electric traction system, are at once adjacent to navigable waters and existing railroad tracks, so that an unlimited supply of circulating water is available, and shipments of coal may be received by rail or by water. Provision is made at each station for an ultimate capacity of 30,000 kw, which is sufficient to operate a train service much greater than that now operated by means of steam locomotives.



GENERATING ROOM IN THE PORT MORRIS POWER HOUSE OF THE NEW YORK CENTRAL & HUDSON RIVER RAILROAD

The station building at Port Morris is a brick and steel structure with concrete foundations extending down to bed rock. Every precaution has been taken to eliminate fire risks, and not a little attention has been given to the illumination of the interior. The building is divided longitudinally by a brick wall into boiler and generator rooms. The latter room extends clear to the roof, and what with windows on all sides and skylights in the monitor, this room is exceptionally well lighted. As the boiler room is surrounded by the coal bunkers, and as the boilers are arranged along both sides of the room, there is little chance for much natural illumination. On the north side of the generator room are three galleries; the first gallery is occupied by a machine shop and

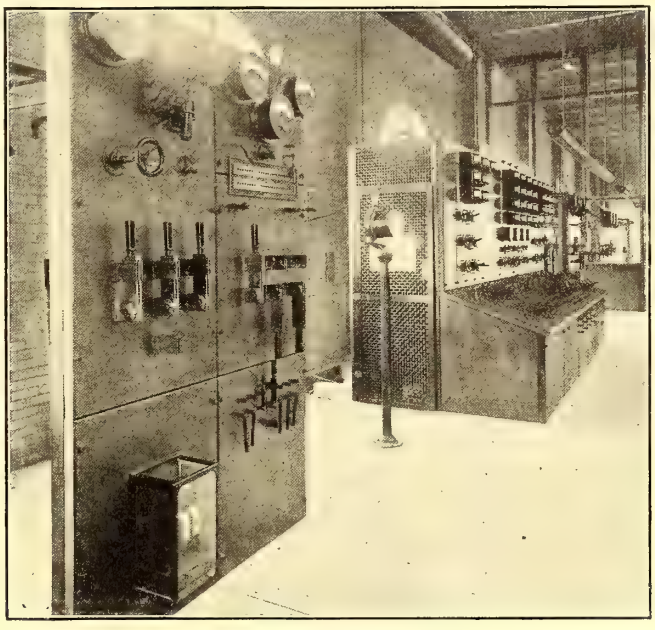
a few offices; the second contains the operating switchboards, and the top gallery is given over exclusively to offices. The boiler room is also provided with galleries and runways for convenient access to all parts of the piping and apparatus.

The present steam generating equipment comprises sixteen Babcock & Wilcox boilers, and space is available for eight more. Each boiler has 6250 sq. ft. of heating surface and 112 sq. ft. of grate surface, giving 10 sq. ft. of heating surface per rated horse-power and a ratio of 55.8 to 1 between the heating and grate surface. A total superheating surface of 1230 sq. ft. is provided in each boiler, in which the steam is superheated 200 deg. F. above the temperature due to the pressure. The rated working steam pressure is 185 lbs., and the maximum steam pressure is 200 lbs. The boilers are rated at 625 hp each and are arranged eight on each side of a central alley. Roney stokers are fitted to all the boilers, and the fuel used is Clearfield bituminous coal. The second pass of each boiler is provided with a soot chute discharging into the ash hopper below the boiler, and the rear of the setting is connected to an outboard drain to carry off the washing-out water. Two radial brick stacks carry off the products of combustion. These stacks are supported on steel columns and a reinforced concrete staging 40 ft. above the boiler room floor, and directly over the boiler-room alley. The chimney has an internal diameter of 15½ ft. and is 250 ft. high above the grates. The flues are of steel, lined with fire brick and tile, and are designed to give a natural draft of not less than 0.7-in. water pressure at the smoke flues.

Coal is at present being brought by rail, the slip at the south side of the station by means of which coal barges may moor alongside the hoisting tower not being completed as yet. The coal cars ascend the trestle on the south side of

BOILER ROOM IN THE PORT MORRIS POWER HOUSE

the station and dump their load into concrete-lined hoppers which discharge into hoppers of two coal crushers. From the crushers the coal is fed to an elevating conveyor of the bucket type, which carries it to a point over the bunkers, whence it is distributed by four suspended-flight scraper conveyors operating independently. Coal delivered by boat will be elevated by means of a hoisting tower to a hopper over the car tracks, and from here it will follow the course of the coal delivered by rail. With the exception of the hoist which is used to unload the boats, the coal and ash-handling machinery is driven by electric motors, ranging in size from 7½ hp for the ash conveyor to 40 hp for the coal crushers and conveyors. The motors are of the three-phase induction type and operate at a potential of 220 volts. From the coal bunkers the coal is discharged to the hoppers of the stokers through cast-iron chutes and distributing aprons. The ashes fall from the grates to hoppers below, which discharge into hand push cars of one ton capacity. These dump their load into conveyor hoppers in the basement beneath the boiler



REMOTE CONTROL SWITCHBOARD IN THE PORT MORRIS POWER HOUSE

room, and the ashes are carried up by a malleable iron bucket conveyor to storage bins over the trestle, where they are loaded into cars.

The apparatus in the station is divided into groups. Each generating unit is provided with four boilers, one feed pump and feed-water heater and a complete condensing plant. The feed pumps are of the Epping-Carpenter duplex, outside-packed plunger type designed for hot water and capable of feeding eight boilers. Each pump delivers through a Wainwright corrugated tube closed heater of counter-current design. The plan of steam piping is quite simple. Expansion is provided for in all places by long bends, no packed expansion joints being employed. The turbines are connected in pairs by 14-in. loops and each turbine may take steam from either of two banks of four boilers each. The auxiliaries are fed with steam taken from the cross-connecting bends between adjacent turbines. Each turbine is provided with a short free exhaust pipe which is independent of the exhausts of the auxiliaries except through the heater vents and emergency connections. The high-pressure steam piping is of mild steel with Van Stone joints and feed and blow-off piping is of heavy cast iron. The main cut-off valves of the turbines are operated from the floor by means of gears and shafting, the operating shaft having a hand wheel on the boiler-room side of the wall as well.

The generating room is at present equipped with four 5000-kw General Electric turbo-alternators, reserve space sufficient for two more units of the same size being provided. The turbines are Curtis five-stage machines mounted on cast-iron bases forming exhaust chambers which are provided with condenser openings and free-exhaust connections. The alternator and turbine are connected together by a coupling. The shaft rests upon a step bearing consisting of two cast-iron blocks between which water is forced under a pressure of 800

lbs. per sq. in. The piping for this system is in duplicate and is fed by three pressure pumps in addition to two accumulators, each of which is normally supplied by a large steam pump. The turbines are governed by successive openings and closings of automatic valves operated by hydraulic pressure controlled by a cam shaft. The valves deliver steam to two sets of nozzles. Should the turbines speed up abnormally, an automatic speed device with which each unit is equipped trips the main steam valve, thus cutting off the supply of steam and causing the turbine to stop.

As shown in the leading engraving, the condenser equipment, which is of Worthington make, is external to the base of the turbines. The condensers are of the counter-current surface type and have 17,000 sq. ft. of cooling surface. They are guaranteed to maintain a vacuum of 28 ins. with cooling water at 70 deg. F., and with a barometric pressure of 30 ins. The condenser auxiliary apparatus is composed of independent units. The air pumps are of the standard Worthington rotative fly-wheel type with air and steam cylinders arranged in tandem on a common base. The pump is double acting and the steam end is equipped with a variable cut-off valve gear and guaranteed to show an economy of 35 to 40 lbs. of steam per hour per horse-power. The circulating water pumps are of the centrifugal type and are driven by Fleming side-crank engines at 250 r. p. m. The hot-well pumps are of the two-stage turbine type, direct driven by 10-hp, 125-volt, direct-current motors. The intake and discharge tunnels for the condensers are elliptical in shape, 7 ft. 3⅞ ins. and 9 ft. 11 ins., respectively, across the minor and major axes. These rest on solid rock and extend into the waters of the Sound.

The alternators are of the revolving field type, delivering three-phase current at 25 cycles and 11,000 volts. The armatures are star connected and the neutrals are grounded through individual cast-iron grid resistances connected to a common ground bus, limiting the ground current under all conditions to the amount necessary to operate the overload relays on the line switches. The guaranteed efficiency of the alternators is 96 per cent at full load. Each alternator is designed for a 50-per-cent overload for two hours and a momentary overload of 100 per cent. The efficiency at one-quarter load is guaranteed to be 90 per cent. The leads from the alternators are brought down to the floor through brass pipe to the ducts leading to the high-tension switches, the arrangement being such that no high-tension conductors are exposed in the generator room.

The exciter system comprises two 150-kw horizontal steam turbine generator sets, running non-condensing under a steam pressure of 175 lbs. and delivering 1200 amps at 125 volts. Floating on the system is a battery of 74 cells with a capacity of 1200 amps. for one hour. There is an additional exciter consisting of an induction-motor generator set running at 500 r. p. m. and delivering 1200 amps. of direct current at 125 volts. The induction motor is a 25-cycle machine of 200-hp capacity taking current at 200 volts. The motor is started by a special switch which puts the transformer windings first in delta, then in star connection. The exciter generators and battery are connected to two independent positive bus-bars and one common negative bus. Two end cell switches are provided on the positive side of the battery. One positive bus is used to excite the fields of the turbo-alternators, while the arc lamps and direct-current motors in the station are connected to the other positive bus.

The entire electrical equipment in the station is controlled from the switchboard gallery on one side of the generator room. Enclosed in a glass booth in the center of the gallery is the operating bench board, on either side of which are separate boards for controlling the exciters. The lamp and motor circuits in the station are controlled from smaller switchboards situated at either end of the operating gallery, and the field panels are located outside of the operating booth on each side. All cables and connections running to the boards are carried on concrete trenches under a stone floor.

Separated from the main station is a switch house containing all the high-tension switching apparatus. In the basement of this building, which is 50 ft. 10 ins. wide and 100 ft. long, are located all the high-tension connections, instrument transformers, cables, manholes, etc. These are placed in separate fireproof compartments, corresponding to the several generating units. Reinforced concrete, vitrified brick and stone are used for barriers and bus-bar compartments, and each leg of the feeder circuit is isolated until three legs meet at the switch. Two sets of high-tension bus-bars are provided, each of which is sub-divided into two and three sections by tie switches. The connections to the bus-bars and oil switches are made with ¼-in. copper tubing flattened at the ends so as to reduce to a minimum the number of insulators. The high-tension bus-bars are connected to the generators through a main switch and two selector switches. Each feeder is provided with two selector switches which connect to the two respective high-tension bus-bars below them. Overload relays are connected in the generator and feeder circuits and the former has in addition reverse-current relays connected to indicating lamps.

On the first floor of the switchhouse are located all the oil switches, divided into unit groups. For each pair of groups there is an auxiliary operating board and instrument board, the latter being equipped with instruments not essential for the switchboard operator, but necessary for the complete equipment of the station. The switchboard equipment in the switchhouse is such that the main operating board in the station may be put out of service for cleaning or repairs, the entire electrical equipment being then controlled from the switchhouse. The entire electrical control apparatus is of General Electric make. The oil switches are type-H and the knife switches which disconnect these from the high-tension system are located in compartments at the bottom of the switch casings, one in each side.

The alternator leads, which are isolated from one another their entire length and from the low-tension cables, are brought over to the switchhouse through underground conduit lines. The same is true for all other cables running between the switchhouse and the station, so that any damage from short-circuits or burn-outs is necessarily confined to the duct in which it occurs. All cables coming through the duct system enter manholes in the basement of the switchhouse. The low-tension cables enter through manholes in a passage separated from the high-tension compartments by a fireproof wall, and are brought up in enclosed chases in the wall. The oil switches have a rated capacity of 500 amps. with the exception of the tie switches, which have a rated capacity of 1200 amps. On the same floor are installed two three-phase transformers, each having a rated capacity of 200 kw, and giving 220 volts at the terminals of the secondary. One transformer is used for the general lighting and motor equipment, while the other is used to supply the induction-motor generator set in the turbine room.

On the second floor of the switchhouse are located the load despatcher's office, the exciter battery with booster and switchboard, storeroom, toilet rooms and apparatus for heating and ventilating system. The load despatcher's office is arranged for the proper distribution of electricity over the system, and in order to give quick relief in case of accident

or trouble the office is equipped with a record board, indicating by means of lamps and plugs which generators, lines, rotaries, etc., are in or out of service and which switches are open or closed. An independent telephone system, exclusively for the use of the load despatcher, interconnects both power stations, all the sub-stations and the train despatchers in the electric zone.

The high-tension cables and the majority of the single-conductor, low-tension cables are cambric-insulated and lead-covered. The insulation is 10-32 in. for the high-tension cables and 4-32 in. for the low-tension cables, with a lead cover 3-32 in. thick. Multiple-conductor cables for instruments and control wiring have a combined cambric and rubber insulation. Single-conductor cables are used for connecting the generators with the oil switches. Provision has been made in the station for fifteen feeders.

Alternating and direct current is used for lamps and motors, the former being three-phase at 220 volts and the latter being at a potential of 125 volts. With a few exceptions all the incandescent lamps in the station, about 1000 in number, will be fed with alternating current, although the lamp circuits are arranged so that they can be thrown on the exciter bus-bars should occasion require it. The thirty-six lamps in the station and on ornamental posts outside the station are fed from the excited circuits, as are also the crane and elevator motors and a few others. The greater part of the motor load is carried by three-phase motors. The amount of power required to operate auxiliary machinery in the Port Morris station is approximately 430 hp, of which 250 hp is supplied by alternating-current motors and 180 hp by direct-current motors. Compressed air is used in the station and switch house for cleaning the electrical machinery and apparatus. This is supplied by induction motor-driven two-stage compressors delivering air at a pressure of about 100 lbs.

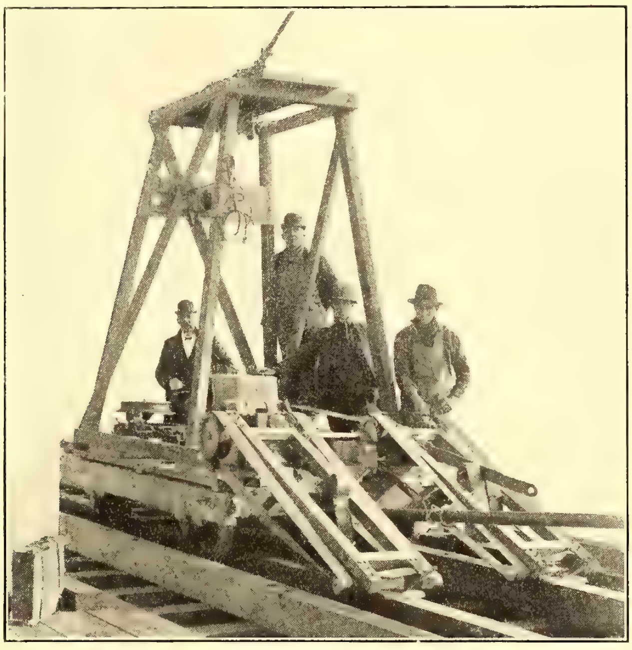
The Port Morris and the Yonkers power stations will be tied together, so that in the event of any part of the generating equipment at one station being disabled the other station will assist in carrying the load. The transmission lines from the Port Morris station are partly underground and partly overhead. Eight sub-stations will be eventually equipped, any one of which may be fed from either generating station. The circuits are so disposed that no ordinary accident can cut off a sub-station from its source of supply. The overhead transmission lines are supported by latticed steel poles set in concrete foundations, and the conductors are either 0000 bare stranded wire cable or of aluminum stranded cables spaced 36 ins. apart on yellow pine cross-arms. All the overhead lines are protected by lightning arresters. At points where the lines change from overhead to underground, cable towers of pleasing architectural design are provided to enclose the connections. Lightning arresters and disconnecting switches are also provided in these towers. The underground cables have three conductors of 0000 stranded copper, with paper insulation and lead sheathing. The duct lines are of vitrified tile covered with waterproofing and laid in concrete. The manholes are designed with regard to the best manner of handling and supporting the cables. Each cable lies on a removable shelving of concrete supported on iron pins. Through the Park Avenue tunnel and along the viaduct, the conductors are carried in 3½-in. steel pipes supported by brackets. The sub-station equipment will be described in a subsequent issue.

The Rockford, Beloit & Janesville Interurban Company, of Janesville, Wis., has granted a one-cent an hour increase to all motormen and conductors who have been with the company more than six months.

ELECTRIC TIMBER PLANING DEVICE FOR OAKLAND PIER

An ingenious use of ready-at-hand machinery and material to accomplish an otherwise tedious task was that made by the mechanical staff of the San Francisco, Oakland & San Jose Railroad Company on its pier on the Oakland side of San Francisco Bay. It was found after the timber guard rails were installed on the pier that they were a little too high to permit the smooth and safe operation of the electric Key Route trains. As the idea of planing them down by hand was a task hardly to be thought of, the arrangement illustrated in the accompanying picture was devised.

The outfit consisted in mounting on a four-wheel truck a standard railway motor, which was used to drive a planer knife on each guard rail. As may be noted from the illustration, the motor was belted to a jack shaft at the rear of the car. Extending behind the car and over each guard rail was a frame carrying at its lower end an ordinary planer head. Each set of planer knives was driven by two belts from the jack shaft, special springs and weights being added to the frame to keep the knives on the work.



ELECTRIC TIMBER PLANER IN SERVICE

The car was pushed along the pier by a regular work car, and received current for its own planer motor direct from the trolley by means of an arm and tower.

With this arrangement the company was able to complete the work of planing the entire six miles of track on the pier in about three weeks, and the task was accomplished with a minimum of expense and, moreover, very satisfactorily. Credit for the arrangement is due to J. Q. Brown, assistant general manager and chief engineer; George St. Pierre, master mechanic, and John R. Scott, foreman, the latter two gentlemen being shown at the left of the picture.

That the transportation of troops by trolley to and from the State muster field at South Framingham, Mass., was a success is shown by the following extract from the report of Adjt.-Gen. James F. Frye:

"The transportation of troops to and from Camp Bancroft was, except in case of one or two companies, accomplished entirely over the lines of the Boston & Worcester. I consider that the experience of this tour shows that transportation of troops and baggage by trolley lines is entirely satisfactory."

THE EMPLOYMENT OF TRAINMEN BY THE UNITED RAILWAYS, ST. LOUIS

Motormen and conductors are practically the only employees of the railway coming in contact with the passengers, and it is, therefore, of the greatest advantage to have them of the highest type of manhood obtainable for the wages paid. The larger a street railway system the more difficult it is to maintain a high standard and the greater is the necessity of exercising extreme care in the employment department. The method of employing trainmen and the system developed to keep individual records of them by the United Railways of St. Louis is of special interest and shows with what importance the employment of trainmen is regarded by the railway company.

UNITED RAILWAYS COMPANY
OF ST. LOUIS.

St. Louis, Mo., __________ *19*

Mr. __________

Dear Sir:

Mr. __________ *giving his address as* __________ *has made application for position as* __________ *with this Company and names you as one of his references.*

Will you therefore kindly reply to the inquiries below, and return this communication in the enclosed envelope?

Yours very truly,
J. F. Davidson

CONFIDENTIAL.

QUESTIONS.	ANSWERS.
1. How long have you known applicant?	*1.*
2. Is he of good moral habits?	*2.*
3. Do you consider him a reliable and responsible person, and one who could be placed in a position of trust?	*3.*
4. If ever in your employ,	*4.*
a. In what capacity?	*a.*
b. For what period?	*b.*
c. Why did he leave?	*c.*
d. Is he temperate?	*d.*
5. Has he ever to your knowledge had any Street Railroad experience.	*5.*

Remarks: __________

Date __________ *19* ____ *Signature* __________

BLANK SENT TO PARTIES GIVEN AS REFERENCES

The employment department is in charge of J. F. Davidson, assistant general superintendent of the road, and the system now in use has been generally developed during Mr. Davidson's connection with the department. All applicants for positions report at 12:30 p. m. and are assembled in a room next to that of Mr. Davidson. They are received in his office one at a time. He acquaints them with the responsibilities and duties of the position applied for, asks them general questions concerning themselves, observes their demeanor and in short sizes them up in general. Those men making a favorable impression and still wishing to join the company are sent into an adjoining room. Those that do not stand this first inspection or who, after being more thoroughly acquainted with the work, do not wish to continue further are sent out through a door leading to the street.

After all the applicants have passed through the office, Mr. Davidson enters the room with those selected and explains to them in detail the responsibilities of the work, what the company expects of them and the routine necessary before they are accepted. Each is given an application blank containing the customary queries, and then the whole form is gone over. Instructions are given in detail as to how the several blanks are to be filled out, but especial attention is given to the clauses in the agreement. These are gone over very carefully and the full import of each is impressed on the applicant. The agreement which the applicant must sign is no doubt one of the most carefully prepared in use by any company. Among other demands is that of total abstinence from intoxicating liquors. Another unusual clause is that which compels the applicant to have four photographs taken of himself, two in civilian's clothes and two in uniform. The agreement reads as follows:—

In case I am employed by the United Railways Company of St. Louis, as a conductor, I.......................... hereby agree that I will totally abstain from the use of intoxicating liquors, and will at all times be strictly temperate: that I will faithfully observe all the rules and regulations governing employees which the management may from time to time establish; and willingly perform all duties assigned me; that any wages earned by, or owing me, shall not be due and payable until the regular pay day of the said company; that if for any reason I shall be suspended from employment of said company, I shall not be entitled to any compensation during such suspension; that when my employment with said company ceases, I will at once return to said company all badges or other property of said company in my possession, or pay for the same at a price fixed

UNITED RAILWAYS COMPANY

St. Louis, __________ 19 ____

Mr. __________ Sup't __________ Division:

Place bearer __________ on with competent instructors;

to be taught the duties of __________ in compliance with the rules of this Company.

Signature of Applicant:

J. F. Davidson
Ass't Gen'l Sup't.

St. Louis, __________

Mr. __________ Sup't:

Bearer __________ was under instructions with the undersigned for the number of days set opposite their names; he is familiar with all the rules and regulations and with the streets along this route and the various branches and transfer points connecting with this Division; he is also familiar with all the switches, curves and turnouts about station. I recommend him as competent to discharge the duties assigned to him.

	FROM	TO	
On with __________			days
"			"
"			"
			"
			"

BADGE No. __________ ISSUED

Assigned to Line No __________ Foreman.

Approved: __________ Sup't.

BLANK SENT TO DIVISION SUPERINTENDENT REQUESTING THAT BEARER BE ASSIGNED FOR INSTRUCTIONS

by the company. That I will have four photographs taken of myself, two in civilian's clothes, and two in full regulation uniform, of such size as may be required, and will deposit same with the company. Said photographs are to become and remain the absolute property of the United Railways Company of St. Louis, whether my application for employment be granted or not.

I am informed as to the character of the work for which I am an applicant, its conditions and requirements and rate of wages, and I am in earnest in my desire to enter and remain in the company's service, and as evidence that I am not trifling with the question or uselessly consuming the time of the company's officials in considering my application, I agree that if I volun-

tarily leave the company's service within ninety days after the date of my employment the company shall retain as liquidated damages the five dollars ($5.00) deposited by me on entering the company's service.

I have made truthful answer to every question in my application, as a guarantee of which I hereby agree that if at any time it develops that any written answer I have made is untrue I will accept discharge from the company's service without protest, and the company shall retain as liquidated damages the five dollars ($5.00) deposited by me on entering the company's service.

I promise to deal honestly with the company, and if at any time in the performance of the duty of conductor I fail or neglect to register fares collected, whether the fares be cash, transfers, passes, tickets or other evidence of passage, I agree in the event of such failure to accept discharge without protest, and the company shall retain as liquidated damages the five dollars ($5.00) deposited by me on entering the company's service.

I have read all of the above, I understand it, and sign it knowingly and voluntarily.

....

(Sign your name in full.)

Witness........................

Address........................

Forty dollars ($40.00) in cash will be necessary for the purchase of uniform and living

(DO NOT FILL THIS OUT.)

No. ....

APPLICATION OF

....

For employment as CONDUCTOR.

.... 190 ..

APPLICANT EMPLOYED.

.... 190 ..

Recommended by

....

....

In case of accident or death notify

....

....

Age ....

Weight ....

Height ....

Color Eyes ....

Color Hair ....

Color Mustache ....

Color Beard ....

Complexion ....

Marks ....

....

....

Receipt No. ....

No. ....

UNITED RAILWAYS COMPANY
OF ST. LOUIS.

APPLICATION FOR EMPLOYMENT.

(Must be filled out in **INK** and be plainly and neatly written.)

St. Louis, Mo., ... *190*....

TO UNITED RAILWAYS COMPANY OF ST. LOUIS.

GENTLEMEN;

I, the undersigned, respectfully make application for a position as CONDUCTOR and therefore state;

1. My name in full (no initials) ....
2. I was born in .... County .... State, on the .... day of .... 18......
3. My general appearance is as follows; Height .... feet .... inches. Weight .... pounds. Color of hair ....
   Color of eyes .... Complexion .... Face .... Nose .... Build ....
   Marks ....
4. Present address .... (City address.)
5. Previous address .... (P. O. address)
   I lived there from .... to ....
6. I have lived in St. Louis since .... (month) .... (year.)
7. I am a {Single / Married} man and have to support myself and .... Housekeeping or Boarding? ....
8. My trade, or occupation, is .... I was last employed by ....
   .... Give their post office address ....
   as .... (occupation) For .... (years) .... (months.)
9. My reason for leaving was (State fully) ....
   .... Date of leaving ....
10. Do you use intoxicating liquors? (State fully) ....
    ....
11. How long have you been out of employment? ....
12. Do you belong to any Secret, or Labor, Organization? .... If so give name ....
13. Have you any defect whatever in Sight, Hearing, or Speech? ....
14. Are you in any way crippled or deformed? ....
15. Have you ever been injured? ....
16. Have you ever been DISCHARGED OR SUSPENDED from any position? If so, state particulars, when and where and for what reason? ....
    ....
17. Have you any relations in the employ of the United Railways Company? If so give their names and positon ....
    ....
18. Have you ever been in the employ of any Street Railway Company in the City of St. Louis at any time or in any capacity? If so, state when, on what Division .... on what line ....
    Cause of leaving ....
19. Have you ever been employed by any other Steam, Street or Electric Railroad Company? If so give full parteulars why you left them.
    ....
    ....
    ....
20. Give dates of your employment during the past four years. Also the names of your employers and their addresses during that time.

Name of employer.	Address.	Your occupation	Date you entered service.	Date you left service.	Reason for Leaving.

21. I refer you for recommendations as to my character, ability and integrity to

NAMES.	POST OFFICE ADDRESS.

(You must name five references)

22. I hereby warrant the truthfulness of the above Statements, And Certify that I can read and write the English language and that I personally filled out this application, and enter into the following

(Read every word of this carefully as you will be held to a faithful performance of the conditions set forth.)

AGREEMENT.

In case I am employed by the United Railways Company of St Louis, as a CONDUCTOR, I .... hereby agree that I will totally abstain from the use of intoxicating liquors, and will at all times be strictly temperate: that I will faithfully observe all the rules and regulations governing employes which the management may from time to time establish; and willingly perform all duties assigned me; that any wages earned by, or owing me, shall not be due and payable until the regular pay day of the said Company; that if for any reason I shall be suspended from employment of said Company, I shall not be entitled to any compensation during such suspension; that when my employment with said Company ceases, I will at once return to said Company all badges or other property of said Company in my possession, or pay for the same at a price fixed by the Company. That I will have four photographs taken of myself, two in civilians clothes, and two in full regulation uniform, of such size as may be required, and will deposit same with the Company. Said photographs are to become and remain the absolute property of the United Railways Company of St. Louis, whether my application for employment be granted or not.

I am informed as to the character of the work for which I am an applicant, its conditions and requirements and rate of wages, and I am in earnest in my desire to enter and remain in the Company's service, and as evidence that I am not trifling with the question or uselessly consuming the time of the Company's officials in considering my application, I agree that if I voluntarily leave the Company's service within ninety days after the date of my employment the Company shall retain as liquidated damages the five dollars ($5.00) deposited by me upon entering the Company's service.

I have made truthful answer to every question in my application, as a guarantee of which I hereby agree that if at any time it developes that any written answer I have made is untrue I will accept discharge from the Company's service without protest and the Company shall retain as liquidated damages the Five Dollars ($5.00) deposited by me upon entering the Company's service.

I promise to deal honestly with the Company, and if at any time in the performance of the duty of Conductor I fail or neglect to register fares collected, whether the fares be cash, transfers, passes, tickets or other evidence of passage, I agree in the event of such failure to accept discharge without protest and the Company shall retain as liquidated damages the Five Dollars (5.00) deposited by me upon entering the Company's service.

I have read all of the above, I understand it, and sign it knowingly and voluntarily.

....

(Sign your name in full.)

Witness ....

Address ....

Forty dollars ($40.00) in cash will be necessary for the purchase of uniform, and living expenses until wages are earned

Have you that amount? ....

FAC-SIMILE OF APPLICATION BLANK USED BY THE UNITED RAILWAYS COMPANY, OF ST. LOUIS

expenses until wages are earned. Have you that amount?....

After a talk of probably an hour the men are told where to have their photographs taken and where to obtain the physical examination. They are also acquainted with the facts regarding vaccination.

The photographs are taken by a photographer in the neighborhood of the offices. They are cabinet size and unmounted and are not retouched or finished. A uniform alters the appearance of a man to such an extent that it is deemed advisable to have photographs taken both with and without uniform. A front and side view with civilian's clothes and with the uniform are obtained.

The physical examination to which the applicant is subjected is given by the company's physician. It includes an examination of the heart, lungs, spine and other parts of the body and a test of the urine. The eyes are tested for color blindness and acuity and the hearing is also tested. The applicant is also compelled to get a certificate of vaccination from the city health department. If he has never been vaccinated he must have it done before his application will be considered further.

After the application has been filled out, the settings for the photographs made, the physical examination submitted to, and the certificate of vaccination obtained, the prospective employee returns the application to the office. If the application has been filled satisfactorily, and the other regulations

complied with he signs the application in the presence of a witness and he is then sent to one of the division superintendents and is given necessary instructions in the details of his new duties. If a motorman he is given a general idea with regard to the apparatus on the car, how to cut the motors out and is taught how to care for many of the emergencies that may arise due to faulty apparatus. The greater portion of his instruction, however, consists in operating the car on the road under the charge of the better motormen of the division. In order that one motorman may not teach false ideas, the new man is put successively under several different men. The conductors are put on the road under the more competent of the older men. The duration of this preliminary training depends on the aptitude of the applicant. When he shows himself competent to assume duties he is returned to the general office.

During the time he is under the charge of the division superintendent the references named in his application blank are being followed up and any credentials he may have presented are being investigated. To those firms or persons offered for reference as to character and ability, a blank form is sent, the questions upon which are mainly concerned with the applicant's habits and general reputation. Other credentials or letters of recommendation offered are followed up and investigated in a similar manner. At the same time the four photographs of the applicant are sent successively to all the division superintendents. This is done to guard against the re-employment of men who have previously been discharged for dishonesty or incapability. Attempts to obtain employment again are very frequent. A total of 11,000 men have been discharged for one reason or another or have resigned since 1900. It would be impossible for one person to remember all of them, but after the four photographs have been inspected by all of the division superintendents and their foremen without recognition, it is reasonable to presume that the man under consideration has never been in the employ of the company.

On being returned to the general office after having served several days on the car, the applicant, if a motorman, is questioned closely on all points concerning car equipment and the handling of the car, and if a conductor, on the route, schedule, names of streets, transfer points and concerning other details, a knowledge of which is necessary for the proper fulfillment of his duties. If the examination is passed successfully he is furnished badge and, if a conductor, with a ticket punch and pocketbook in addition. He is then sent to a division superintendent who is instructed to put him on the extra list. If in the meantime the investigation of his references brings to light anything derogatory to his character he is discharged and not considered further.

The routine followed in employing a man requires the use of several forms and receipts in addition to the application and photographs. It is of the utmost importance that such papers and other information concerning each man be kept where they can be gotten at readily. A card system has been developed for this purpose, by means of which ready access is obtained to all the papers and information concerning any one of the 2400 trainmen employed or of the 11,000 who have resigned or have been discharged.

Two sets of card indexes or files are kept, the live files for the men employed and the dead files for former employees. The cards are kept in the drawers in alphabetical order, and refer by number to envelopes containing papers relating to the applicant for whom the card is made out. The card files, together with the envelope files to which the cards refer, are kept in a fire-proof vault. The card measures 4 ins. x 6 ins. and is large enough to carry the more important items of the information on the application blank. It also has a blank space for the date of discharge or resignation of the employee and another for the cause of the discharge. The specific cause of the discharge is written on the card in a way understood by those who have access to the record. The back of the index card is reserved for a general record of the employee. Any breach of the rules, improper conduct when on or off duty, and accidents to passengers, whether or not the

APPLICATION No.

ST. LOUIS, 190

Mr.

DIVISION SUPERINTENDENT.

Mr. Motorman / Conductor No. has passed the necessary examination, been furnished a Badge and is ready to be assigned.

Yours truly,

ST. LOUIS, 190

I have received of The St. Louis Transit Company, a Motorman's / Conductor's Badge No. , also a Ticket Punch and Pocket Book, all of which is the property of The St. Louis Transit Company, and which I agree to surrender on my leaving the employ of said Company. I have also been furnished with a printed copy of the rules and regulations governing Conductors and Motormen of this Company, have carefully read same and agree to cheerfully comply with all of said rules, regulations and conditions contained therein. I further agree to comply with all additional rules hereafter made to be observed by employes.

Mr.

FOREMAN

Please assign Mr. to a place on the extra list.

SUPERINTENDENT

The above party reported for duty 190 , and was assigned to Line.

FOREMAN.

MR J F DAVIDSON,
ASSISTANT GEN'L SUPT.

Dear Sir:

Mr. having reported and been assigned for duty, I return herewith this blank properly filled out.

Yours truly,

SUPERINTENDENT.

Present address of applicant:

Division.

TRAINMAN'S RECEIPT FOR BADGE AND ASSIGNMENT FOR DUTY

PHYSICAL EXAMINATION OF EMPLOYES
FOR THE
UNITED RAILWAYS COMPANY
OF ST. LOUIS

St. Louis, 190

Mr.

Sent for Physical Examination by

SUPERINTENDENT

Signature of Applicant *No.*

Height *ft.* *in.* *Age* *Weight* *lbs.*

Lungs

Heart

Spine

Is there a rupture?

Are there varicose veins?

When where you last ill?

What are your habits in regard to the use of ardent spirits, wine and malt liquors?

Do you use tobacco, and how much daily?

General physical condition

Examination of Urine. Specific gravity Reaction Albumin. Sugar.

Applicant has *passed required examination.*

M.D.
MEDICAL EXAMINER

	SIGHT			HEARING		
	ACUITY	FIELD	Color Perception		WATCH	VOICE
Right,				Right,		
Left,				Left,		

Applicant has *passed required examination.*

OCULIST

REMARKS

BLANK FILLED OUT BY THE EXAMINING PHYSICIAN

employee is at fault, are noted on the back of the card. A frequent notation is that of passengers falling when entering or leaving the car. This, as a general rule, is not the direct fault of the motorman or conductor but if it occurs with unusual frequency on any one man's car, it may rightfully be presumed that he is indirectly at fault. The reports entered on the back of the cards are obtained on blank forms from the division superintendent and foremen. The envelopes containing all the papers of applicants are of heavy manilla and measure 5½ ins. x 10½ ins. They are kept in vertical files about 100 to each drawer.

No ... St. Louis, Mo., ... 19..

J. F. Davidson,
No. 3869 Park Ave., City,
Dear Sir:-
Please enter on the record of ... Conductor / Motorman
Badge No ... *on* ... *Line*
On account of ...

Disciplined
Suspended
Discharged
Resigned

Put check mark opposite cause for which report is made

Supt.
Foreman

REPORT OF DIVISION SUPERINTENDENT ON CONDUCT CAR MEN

In promoting men where other things are equal preference is given to those longest in the employ of the company. When a man is accepted, to avoid possible confusion, record is made of the minute and hour he is employed, as well as the day. A separate card file is kept with the cards arranged with reference to date of employment, and this facilitates finding the next men on the list. When a trainman leaves or is discharged his card is changed to the "dead" file. His letters of reference and any other of his papers in the company's possession are returned and he is compelled to sign a receipt for them. His application and photographs are retained in the envelope in the file with other papers. Attempt is made to keep track of all the former employees, as frequently their services are demanded by the claim department years after they have been discharged. Information as to their whereabouts is obtained in various ways and is recorded on the card in the "dead" file.

In order to locate a man when a complaint against him mentioning only his badge number comes to the office, a record with badge numbers in numerical order and the name of the employee opposite is kept. A deposit of $5 is required on the badge and a receipt for this amount is given by the treasurer. Throughout the whole system a color scheme is employed to distinguish motormen's cards, application blanks and other forms from those of conductors, yellow being used for motormen and blue for conductors.

Although the system of files and records was developed for the convenience of the employment department alone, it is used extensively by all other departments and especially by the claim department. As the cards contain a record of all suits filed, and a note of every accident or mishap they are often of assistance to the claim department in making investigations, and frequently also if this department wants to get into communication with a former employee his address can usually be obtained by reference to the records.

One advantage of the system is that the routine necessary to be gone through before employment can be obtained is such as to discourage the irresponsible applicant who merely wants a few days or a few weeks' work. A man who will go through all of it is usually one who is in earnest and will take an interest in his work.

The system has another advantage in that the wandering conductor who is in the habit of obtaining employment first in one city and then in another, merely for the purpose of robbing the companies by pocketing fares, is rather reluctant to having his photograph taken and submitting to the examinations. And when men of this class do apply it is very seldom that they are able to pass through, as the investigation of their references and credentials usually shows them up in their true light.

L 12.
Name ... Badge No.
Div. ... No.
Employed ... 19 ... O'clock. Got Badge ... 19
Height ... feet ... inches. Weight ... pounds. Hair ... Eyes
Resides at
Single. Married. Born at ... Age
Occupation ... Last employed by
At
Recommended by
Previous Railroad Experience ...

DISCHARGED / RESIGNED ... 19 ... For

(OVER)

CARD FOR FILING EMPLOYEE'S RECORD IS WRITTEN ON THE OTHER SIDE

ELECTRICAL EQUIPMENT FOR THE HUDSON COMPANY'S TUNNELS

The twin tunnels of the Hudson Company, connecting Jersey City with New York under the North River, were described in the Street Railway Journal for Nov. 25, 1905. Construction work on two of these tunnels has been completed, and work on the electrification will begin at once. Fifty electric cars will be operated in trains by the Sprague-General Electric multiple-unit system and third rail. Each car will be equipped with two GE-76 (160-hp) railway motors. Power for this new development will be supplied from a large station on the New Jersey side, located between Jersey City and Newark. Curtis steam turbines will be employed; initial equipments including two 3000-kw, 11,000-volt machines and two 6000-kw, 11,000-volt machines. The total power so generated will be distributed at high voltage to three sub-stations where the alternating current will be stepped down to 650 volts direct current through transformers and rotary converters. These sub-stations will be located as follows: Sub-station No. 1, Greenwich and Christopher Streets, New York, containing five 1500-kw rotary converters and fifteen step-down transformers; sub-station No. 2, Washington and First Streets, Jersey City, containing four 1500-kw rotary converters and twelve step-down transformers; and sub-station No. 3, Cortlandt and Church Streets, New York City, containing two 1500-kw rotary converters and six step-down transformers. Each sub-station will, in addition, contain one spare 1500-kw transformer.

The peach crop on the Marblehead peninsula, which is traversed from end to end by the Toledo, Port Clinton & Lakeside, will reach a million bushels, and the traction line is getting more of this business than it can handle. Cars are loaded at Fort Clinton and other places and the baskets loaded into the Toledo freight terminal station. Then at night after the city cars have stopped running they are taken direct to market and unloaded for morning sales.

QUARTERLY MEETING OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION

The first quarterly meeting of the Street Railway Association of the State of New York, since the annual meeting at Saratoga last June, was held at the Fort Orange Club, Albany, N. Y., on Wednesday, Sept. 19, 1906. President J. N. Shannahan, of Gloversville, called the meeting to order at 11:45 o'clock. He announced that the meeting was to be devoted especially to a discussion of the question of braking, and of the proper height of car step. This was done at the request of Commissioner Baker, of the New York State Board of Railroad Commissioners, who had agreed to be present. Mr. Shannahan then called upon G. C. Graham, superintendent of car equipment of the International Railway Company, of Buffalo, and H. S. Williams, assistant electrical engineer of the Utica & Mohawk Valley Railway Company, to read their papers on this subject. These papers are published on pages 475 and 476 of this issue.

After the presentation of these papers the president asked Mr. Barnes and Mr. Baker, of the State Railroad Commission, if they would address the meeting on the subject. He said he understood that owing to the failure of the brakes on certain occasions, the question had been brought prominently before the Board and that was the reason why a discussion on the subject had been requested..

Mr. Barnes, in replying, said that he wished first to correct an impression which might possibly have been given by the chairman. It was not owing to accidents in New York State that this question of braking was taken up by the Railroad Commission, but on account of the number of accidents occurring outside of the State, and he wished to congratulate the managers assembled in Albany on the few accidents that had happened on their roads from the failure of brakes or other causes. Some years ago, in the early days of electric railroading, Mr. Barnes said, the question of safety of operation was quite a serious one, and the Commission decided at that time, and has since held, that safety of operation on heavy grades, on city and suburban lines, required the double-chain brake, and a number, if not nearly all the railways of this State, had their cars so equipped. The Board has continued that recommendation to the railway companies, until recently it found that several roads had discontinued the use of the double-chain brake on account of defects which were developed by the idle chain. He wished to get at the facts in the case and the value or undesirability of the double chain. He then cited a suburban railroad, operating to a summer resort with a heavy grade and running cars on 2 minutes' headway, whose cars were equipped with a single-chain brake. The possibility of accident in such case as that with a broken brake chain, Mr. Barnes thought, was very great, as the conductor might be in the center of the car and wedged in where he could not get to the rear platform, and the motorman would be practically helpless. The experience of the Board is that there is not one accident out of ten in which the motorman does not claim that he tried to control the car with his reverse, but was unable to do so. Recognizing the ability and practical experience represented in the membership of the New York State Street Railway Association, the Board thought it was a subject which properly could be brought before the association, and some methods of additional security recommended in the cases mentioned, that is, the operation of cars, city and suburban, on heavy grades. The Commission, Mr. Barnes said, is at present of the opinion that the single chain is not sufficient security for the proper control of cars under such circumstances, but is open to conviction that the single brake chain is desirable.

John A. Hanf, of Buffalo, said that from an operating standpoint the air brakes are a Godsend on trolley cars, but from a mechanical standpoint we sometimes wish He had not sent them. On interurban lines Mr. Hanf did not see how it would be possible to get along without them. It would certainly not be possible to make a short stop, on a high-speed line, with the old-time method. The trouble with air brakes is that they are misused by motormen. It is no harder to throw on the emergency than it is to apply part of the air. With the hand brake it takes manual power to apply the emergency, and it is safe to say that the emergency is not applied unless the motorman finds himself in a very tight place. His own way of testing air brakes is to take a car on a good rail, get it up to full speed, and then throw his hand on to the emergency. The car wheels should then skid 4 ft. or 5 ft., just before the car comes to a stop. This was found to work very satisfactorily until the motorman or others got to monkeying with the air reservoirs. A car will be sent out of the shop, say with 60 lbs. of air, and three or four weeks later it may come back with 70 or 80 lbs. This has frequently been found to be the case, and it is sure to make trouble for the mechanical department and mean many dollars out of the company's treasury to pay for the flat wheel nuisance. The brakes, however, are not the only cause for flat wheels. The sand car should also be considered. While not wishing to divert attention from the discussion on brakes, he hoped before the session was concluded that the subject of sand and sand cars would be discussed .

The president asked Mr. Hanf what his experience had been with the double chain.

Mr. Hanf replied that the double chain got sticky, especially in winter weather, and had not been so satisfactory as the single chain. He had had, however, very good results with a hand brake which winds up a single chain on a drum. This drum starts in with a circumference of perhaps 4½ ins. at the top and winds up at the bottom with perhaps a 2-in. circumference. The further down one goes the more power he gets. The speaker considered this brake the best on the market for a hand brake.

A delegate asked Mr. Hanf how many broken brake chains he had had in a year.

Mr. Hanf referred this question to Mr. Graham, who said he had never known of a broken brake chain or of an accident which had occurred through a brake chain breaking. One of the speakers had referred to trouble caused by the motorman trying to use his reverse to avoid accident. This occurs frequently where the motormen are not accustomed to the process. With the circuit breaker over his head a man will naturally throw his controller on the fifth point in making an emergency stop. If he is operating a four-motor car and going at fair speed, he ought to pull the reverse lever and never mind the controller. The car will then check itself. But the minute the motorman throws the power on, he blows the circuit breaker. The chains are differently wound in modern brakes than formerly; they are not held by ⅝-in. bolts, but are wrapped on a drum. This gives better results, as formerly the whole strain used to come on the bolt. The double nut is always used, but the bolt was the main means of support.

Mr. Fassett, of Albany, said that he also had had no broken chains. The Albany cars are rather light, but they operate on very heavy grades. As the chains become worn they are taken off and new ones are put on. This is due to the thorough inspection which the cars have. The grades are frequent and as high as 9 per cent. The company has a few cars equipped with air brakes, but all the cars operated on the hill have a hand brake, and in addition an emergency

brake. If the car is going up the hill the emergency brake can be applied to prevent the car from dropping back down the hill. In case of any breakage of any part of the operating mechanism of the car, in going down hill, the instruction to the motorman is to reverse his power and get the car moving as slowly as possible, and then drop the emergency brake for the purpose of holding the car. This has been done on numerous occasions when brake rods and other things have given out. As stated, if the reserve is properly used it is all right, but the Albany Company has had such bad experiences with the reversing of cars to prevent accidents, it is now the company's rule never to reverse the car at any time except when the braking apparatus is out of order. The company has found by making tests as to the stopping of the car by reversing that it cannot be stopped more quickly than with the usual application of the brake, and in most cases the circuit breaker was thrown and the car rendered helpless, and the motorman had to begin all over again with the hand brake.

Mr. McDonald, of Montreal, thought that the double brake chain originated with the horse-car systems, where the double chain, or second chain, was the only auxiliary available in the case of the breaking of the main brake-chain. The up-to-date car has an air brake, a hand brake, and the possibility of the reversing of the car, so that the necessity for that second brake-chain is considerably diminished. Of course, the reversing of the power, as has very properly been said, is often the occasion of the blowing of the circuit, but there is still the further auxiliary, which is not so positive, but which works on about 90 per cent of the grades in Montreal, and that is putting the motors in opposition. Even after the power or circuit has been blown, this will still hold the car on the grade almost as effectively as the air brake or any other braking mechanism which can be put on the car. Mr. McDonald had no data at hand at the moment, but felt very safe in stating that his company had not had any failures of brake-chains for the last three years. This fact made it still clearer, to his mind, that the second chain is becoming more and more unnecessary, and there is really no good reason for its use. The Montreal standard car to-day has an air brake and a hand brake, and has still the further auxiliary on the latest type of cars of having the conductor at all times on the rear platform, which does away with the possibility of the conductor being wedged in the middle of the car, as was described by Mr. Barnes. It did not seem possible to him, therefore, that these five different methods, the principal methods and the auxiliary methods, which the company has of stopping the car would all give out at the same time.

Mr. Barnes then said that he did not want any one to get a wrong impression of the attitude of the Railroad Commission toward the question of the double-brake chain. It was represented at the convention to secure information, and was not wedded to any one form of device. It wished the convention to consider if any means of additional safety, any additional safeguard, is necessary on cars operated on heavy grades, and if so, what? As he had stated before, the electric railways in the State had been quite free from accidents caused by the failure of the braking apparatus, but there had been accidents where the cars could not be properly controlled, and they showed the possibility of accidents occurring under heavy traffic conditions and on heavy grades. Did the convention consider air brakes or emergency brakes of some kind necessary?

T. W. Wilson, of Buffalo, thought the selection of the proper type of brake depends upon the size of the car. Thus a 21-ft., 23-ft., or a 24-ft. car does not need an air brake. Such a car can be controlled by the hand brake successfully, and have the assistance of the motors operating in opposition to each other, in case the brake gives out. This gives two means of stopping the car. When the length of the car is, say, 27 ft. and over, it should have some sort of power brake, and his experience has shown that the straight air brake is the most successful. The Buffalo Company has quite a number of cars equipped with electric brakes, but the trouble with the electric brake is that when the car comes to a stop on the hill the brake releases until the car gathers a certain momentum again. He agreed with the other speakers that the double chain is not an additional safeguard. but considers it rather the reverse, and thinks it defeats the very object for which it was designed.

D. F. Carver, of Rochester, being called upon, confirmed the statements made by the other delegates about the second brake-chain clogging. He thought that the second chain is of little value, and that it causes considerable trouble, especially in winter. Last winter he took the second chain off the Rochester cars and turned the special feature of the winding post down to a straight post, and the cars are now running with the one chain only. These cars are wired up, so that it makes no difference whether the pole is on or not or the circuit breaker is in or out, if the motorman properly handles his car he can bring it to a stop with that one brake-chain. The experience in Rochester has been that the point of breakage is not nearly so likely to be in the chain as in the foot of the post, and that the double chain is not really the safeguard it is intended to be, because there still exists the liability of failure of an important part of the brake rod, by striking against something. This is especially the case where the car body has been kept low and where there is little room between the floor of the car and the motors. For this reason Mr. Carver suggested that more attention should be given both to the pulling lever and the brake rod rather than to the chains themselves.

A. H. Stanley, of the Public Service Corporation of New Jersey, said that his company was equipping all of its double-truck cars with the stored air system. It has never had an accident since his connection with the company, covering a period of some six or seven years, which has been due to any fault or defect in the stored air brake system, but the company has had accidents with cars equipped with the automatic air-brake system. In the case of the 150 cars which the company now has, which are equipped with the motor-driven system, the pumps are being removed and the stored air system is being installed. In so far as the chain is concerned, the company uses the double chain and has had no accidents in which there was any justifiable criticism of the double chain. Perhaps the company's winter conditions are more favorable than those of the other companies represented. The sun generally shines in New Jersey, and there is not much snow. This milder climate may make some difference. His personal judgment is that a double chain is not absolutely essential. The braking apparatus still has a vital weakness in the rods, and this no double chain, or six chains, will prevent. Where there are so many auxiliaries, particularly in the use of reverse, he did not see that there was much chance for an accident. For light cars he was convinced the hand brake was sufficient even for heavy grades. He was interested to learn, however, the experience of others with emergency brakes.

Mr. Barnes remarked that if emergency brakes were used they would have to be tried frequently and thus kept in working order to be efficient.

The president then called on W. H. Collins, master mechanic of the Fonda, Johnstown & Gloversville Railway, to describe his experience with magnetic track brakes.

Mr. Collins said that on the Hagaman division of his line, in the city of Amsterdam, there is a 14-per-cent grade on which the company operates single-truck cars, equipped with the magnetic traction brake and the ordinary hand brake. He saw no benefit to be derived from the use of the double chain. The company took off the ordinary straight link chain formerly used on its cars, and equipped them with a heavy twisted link chain. The hand brake is employed as an auxiliary. The magnetic traction brake is used as an operating brake, up and down the hill, and in alternately using the hand brake and the electro-magnetic brake, the company has experienced no trouble whatever in operating the cars satisfactorily. Mr. Collins thought an important point was what to do when the rods break. Then a hand brake or an air brake is practically useless. To overcome this objection on his long cars equipped with air brakes, he said that where the cylinder levers go through the guide, instead of running them on top of the ordinary guide they were made double and a block was put in, allowing sufficient room for the piston to travel the ordinary length. Then in case of the rod breaking the lever on the opposite end comes against this block and gives a brake on one truck, and this will hold the car on any grade on which these cars are run. This was quite desirable, as the cars are equipped with the type-M controller.

In reply to an inquiry from Mr. Barnes, Mr. Collins said that he would not consider it an additional element of safety to have the cars on the Market Street hill equipped with air. The wheels can be brought to the sliding point with the hand brake, and that is all that could possibly be accomplished with air brakes. He thought that these cars should be equipped with an emergency brake, and considered the magnetic brake the best emergency brake with which he was acquainted. These cars, as stated, are single-truck cars, weighing from 12,000 lbs. to 13,000 lbs., and are 27 ft. over the buffers.

L. L. Smith, of Schenectady, in reply to an inquiry as to whether air brakes had been applied successfully to single-truck cars on his line, said they had equipped one of their single-truck cars with air, within two or three weeks, as an experiment. So far as the working of the brake mechanically or pneumatically is concerned it is a big success. The only question is whether it is necessary or desirable to equip such a small car with an air brake. So far as making emergency stops with cars equipped with the type-M controller is concerned, the conditions are a little different than with the type-K controller. With the type-M there is quite a large frame box containing the reverser and weighing perhaps 100 lbs. If in an emergency the fuse should go out in an operating circuit, the reverse acts, and if it is possible to get at it, it can be thrown in. When the cars of the Schenectady Railway were originally equipped, these reversers were hung under the car, but the reverser has now been put inside the car under the seat in the corner of the car, and is quite a safety device. If through any means the hand brake or air brake is inoperative, the reverser can be thrown quickly and the car can be stopped by the current.

Nelson Graburn, of Montreal, said that the Montreal company uses the double brake chains on all the cars, and has not had any trouble with them. The lower chain is one link longer than the upper, and is hung loose. The top chain is always in service. The company uses both double chains and air brakes, and considers the double brake-chain is essential. The line contains many heavy grades and the company must have emergency brakes on its cars, especially on the Guy Street hill, which has a 13-per-cent grade and is about a quarter of a mile in extent. The cars which run on the bad grades are also equipped with a screw brake which works through the center of the car and has at its ends two prongs of 3-in. bar steel which go down on each side of the rail. This is the only emergency brake which will stand on that hill. These brakes are somewhat similar to those used in Cincinnati, and are very satisfactory.

Mr. Stanley said in regard to an inquiry as to the use of air brakes on single-truck cars that the Detroit United Railway had all its cars, both single and double-truck cars, equipped with air, as a city ordinance requires all cars to be equipped with power brakes. He believed that the use of air brakes on these city cars has increased the number of accidents materially, as the tendency of the motorman is to make "grand-stand" stops. The simplicity of the application of the power, and the enormous power back of them, have encouraged the men to take chances unnecessarily, which they would not do with the hand brake, and have prevented them from appreciating the condition of affairs and the liability of accidents at different points along the line. They cannot feel the power exerted by the brakes, when applied, with the air brake as they can with the hand brake, and they are prone to take undue chances with the air brake on the small cars.

In reply to an inquiry as to the proportion of the cars in Detroit which were single-truck cars, Mr. Stanley said that up to four years ago the system operated approximately 1300 cars, and of these 1300 cars only 100 were double-truck cars. The single-truck cars have an 8-ft. wheel base, and are quite heavy; he did not remember the exact weight. The company did not oppose equipment of the double-truck cars with power brakes, but it did object to equipping the single-truck cars with air brakes. The courts, however, declared the ordinance legal, and under it all the cars were so equipped. He did not consider that the experience at Detroit with air brakes was in favor of their use on single-truck cars.

In reply to another inquiry Mr. Stanley said that his experience showed that air brakes were undesirable upon any car used principally for city service, whether single-truck or double-truck. The results in New Jersey, where the company is equipping some 2000 cars with air, showed that the accidents have increased in the case of the city double-truck cars with the use of air brakes. In fact, the motormen in that part of the system where the company is equipping its double-truck city cars with a good hand brake preferred that brake rather than the air brake, as a matter of protection to themselves. They use the air more as a matter of emergency. With suburban or interurban cars the case is different. Here it is desirable to use air, because of the excessive weight of the car and the wear on the motorman in handling such a heavy car, and for no other reason; not that they have a greater braking power, but because of the wear on the motorman.

Fred DuBois, of Syracuse, was called upon, and said that they had used double chains in Syracuse and had had the same experience as that reported in Buffalo and Rochester. They were not satisfactory in freezing weather. The company is now operating its cars with hand brakes, but uses air brakes on heavy grades, but there for auxiliary purposes entirely. The hand brake is not depended upon for emergency stops, but for ordinary stops only. The company has not had any experience with broken brake-chains, and conducts a very careful inspection. Of course, chains have broken, but they are usually broken through inspection. He agreed with the remarks of Mr. Collins in regard to the rods.

A delegate asked Mr. Smith if with the type-M control it would be possible to work the reverser by means of a system of levers operated from the motorman's cab in case of an emergency.

Mr. Smith said that that matter was considered a number of years ago, and a car was equipped with a system of levers to accomplish that purpose, but nothing further was done, as it was decided better to put the reverser in the car, as already described.

Mr. Barnes said that the opinions expressed seemed to be very general that the double chain was unnecessary, and he wished to know whether that was the sense of the meeting.

Mr. Wilson then offered a resolution, to test the opinions of the delegates, that it was the sense of the association that the double chain on the brake was not an additional safeguard. Mr. Wilson's resolution was put to vote and carried.

PROPER HEIGHT OF CAR STEP

The president then announced that the next business in order was the report of the committee on "proper height of car steps." He added that this question came up at this time because of various complaints which had reached the Board of Railroad Commissioners, and it was their desire that the association should take this question up. Mr. Peck, general manager of the Schenectady Railway Company, then presented the report of the committee.

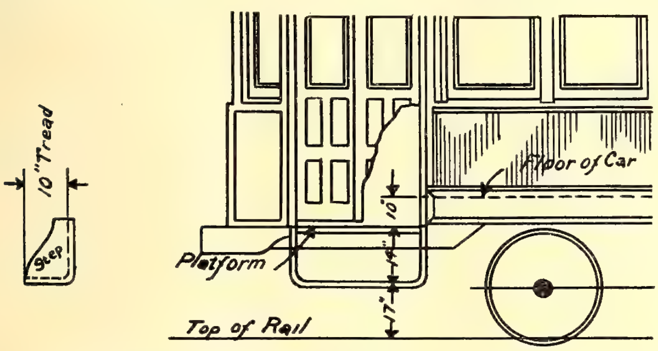
REPORT OF COMMITTEE ON THE PROPER HEIGHT OF CAR STEPS

The committee appointed by you to take up the question of the proper height of car steps beg to report as follows:

It is recommended that the maximum height between the top of rail and first step of all passenger cars of the box type with 33-in. wheels be 18 ins., with a minimum height of 14 ins.

That the maximum distance between the first step and platform of car be 15 ins., with a minimum distance of 12 ins.

That the maximum distance between platform of car and top of floor of car be 10 ins., with a minimum distance of 8 ins.



It is the opinion of the committee that an ideal condition would call for a height of 17 ins. from top of rail to the first step, and from the first step to the platform 14 ins., and from the platform to the floor of car 10 ins., making a total distance from top of rail to floor of car 41 ins. It is also recommended that the tread of all steps be not less than 10 ins.

A sketch showing these conditions is herewith attached.

After reading the report Mr. Peck said that it was signed by two members of the committee. Mr. Millen, the third member, had been unable to join in the conference, but the following letter from him had been received.

LETTER FROM THOMAS MILLEN, GENERAL MASTER MECHANIC OF THE NEW YORK CITY RAILWAY COMPANY

I am in receipt of your favor of Sept. 13, relative to the meeting in New York. I am very sorry that I was unable to attend this meeting.

I notice the height of the first step 17 ins., the second step 14 ins., and the platform of car 10 ins., I do not see how you could get them much less, where you use the 33-in. wheel. Of course in New York, where we use the 30-in. wheel, we have our first step 14 ins., second step 12 ins. and platform 9 ins.

It will be impossible for me to attend the meeting in Albany on the 19th, owing to a previous engagement out of the city.

The secretary suggested that the committee state whether its report was intended to cover two-step cars, and also whether it included the running board of open cars.

Mr. Hanf, in explanation, said the committee found the platforms of box cars to be all the way from 26 ins. to 34 ins. or 35 ins. from the top of the rail to the platform. He thought 32 ins. from the platform to the top of the rail should be the maximum. In this case it would be best to make the first step 18 ins., the second step 14 ins., and the step from the platform to the car 10 ins. This would do for interurban cars. For city cars this distance can be dropped one inch, that is, make it 31 ins. from the top of the platform to the top of the rail. That makes the first step 17 ins. It would be very hard to make this change on old cars. It will be necessary to drop the platform on some of them. On the Falls line, in Buffalo, the first step is 19½ ins., while the second step is only 12¾ ins. That second step could be dropped to 14 ins. very nicely, and this would reduce the first step to about 17½ ins. The step from the platform down should be 14 ins. in all cases. In open cars it is pretty hard to get a two-step. To get down low enough the first step would have to be 19 ins. high. That is too high. The only way to overcome that is to have three steps, the first one perhaps 14 ins. and the other two 12 ins. deep. Where maximum traction trucks are used it would be possible to get along without three steps by making the first step 18 ins. and the second step 16 ins. The Buffalo company has fifty cars running with that kind of step, and there does not seem to be any complaint about them; but with the fourteen-bench open cars, where larger trucks are used, the cars are a little high, and he saw no way of overcoming the trouble except by the use of three steps.

J. H. Pardee, of Canandaigua, thought 14 ins too high. His line had tried cars with two steps, each 14 ins. high, and there had been complaint about them.

The president asked the opinion of Mr. Barnes on the report.

Mr. Barnes complimented the committee on its work. Nevertheless he thought that the height of the riser into the car might be made 10 ins., and this would allow a lower step. It had been suggested that 14 ins. or 17 ins., as the committee has reported, is a pretty high step, and if possible it should be reduced. He thought that the second step is a great deal easier than the first, because the person has the benefit of the grab handle, and is part way up into the car. If the conditions were reversed, that is, if the first step was 14 ins. from the ground and the second one was 17 ins. in height, it might be better.

Mr. Fassett pointed out that the trouble with the three-step car is that the person steps on the third step with the wrong foot—he cannot help it. The Albany company has had a great deal of trouble in that respect. Five years ago it equipped all of its open cars with a folding double step. The first of this year ten were so equipped, but many persons in getting off the car seemed to stumble. They came down with the left foot, then with the right, and then with the left again, and that is the trouble with the three-step car. For the two-step city car, he did not see how it would be possible to get away from the high step, or a 16-in. step at any rate, as the cars are up over the wheels 33 ins. Of course, in the case of suburban service, like steam service, a pair of stairs can be constructed leading into the car if that should seem desirable.

Mr. Barnes asked if Mr. Fassett did not think it would be easier if the rise from the ground to the first step was 14 ins. and to the second step 17 ins.

Mr. Fassett replied that he did not think it would. The first step is a variable quantity and depends on the load on the car and the conditions of the springs.

Mr. McDonald, of Montreal, said that in that city 16 ins. are allowed for the first step, 12 ins. for the second, and 9 ins.

for the third step or riser from the platform to the car. The company has had no complaints against the 16-in. step, but he feared they might have some objections if they made the first step 17 ins. Sixteen inches seems to be the average gage of the ordinary passenger's step that can be taken without much effort. The reason for the second step being so much less is that then the passenger gets into stairway conditions, that is, a comfortable stairway has steps not over 8 ins. or 9 ins. in height. He did not believe it possible to get down to 14 ins. for the first step unless by making three steps to the car platform and another one into the car. The Montreal company has several cars so equipped, and has found them very slow and that it takes a long time for passengers to board and leave the car.

Mr. Barnes asked what the committee thought of making the first step 16 ins. and the one from the platform into the car 11 ins.

Mr. Hanf thought that might be possible on single-truck cars but not on double-truck cars. The best that could be done on double-truck cars is 31 ins. from the platform to the top of the rail, and that must be divided into two steps or three steps, and then from the platform into the car floor 10 ins. On interurban lines, where larger wheels are used, the minimum height is 1 in. more, that is, 32 ins. from the platform to the top of the rail. He did not see any way to overcome the trouble except by going to a single-truck car.

Mr. Carver said that the Rochester company had given a great deal of attention during the last four years to trying to get the car step down lower. The company built an experimental car for this purpose and made the first step 15 ins. from the ground, the next 13 ins., and the next one 10 ins. It made a nice car to get into, but brought the car platform too close to the springs, if ordinary springs were used, as the springs would strike the floor of the car. Stiffer springs were inserted, but then the car was found to be very hard riding. The company then raised the bolsters, but made the step about 16 ins.; 15 ins., he thought, makes an almost ideal step, but he did not think this height possible with 33-in. wheels unless such stiff springs were used on the trucks as to make the car uncomfortable to ride in.

Mr. Barnes then said that the Board of Railroad Commissioners did not expect railway managers to do the impossible, and that he was very glad to hear this expression of opinion. His suggestions that the first step be lower were made principally to learn whether it could be brought about or not. From the evidence presented it seemed to be impossible.

Mr. Hanf explained that the figures given in the report were for a 33-in. wheel, and that with a 30-in. wheel the step could be dropped 1½ ins. lower.

Mr. Fassett then moved that the report of the committee be accepted. Carried.

FARE COLLECTING IN MONTREAL

Mr. McDonald, of Montreal, at the request of the president, then described the pay-as-you-enter car recently adopted in Montreal. The previous method of collecting fares, he said, was with a portable fare box which was subjected to the same deficiencies in collecting as the usual register system; that is, it depends altogether on the accuracy of the diagram that the conductor can keep in his mind during ten hours a day of the distribution of his passengers, those who have paid and those who have not paid, and depended also on the willingness of the public and on the efficiency of the conductor and his good will and zeal in getting fares, whether the company got its receipts in their entirety or not. The pay-as-you-enter car was devised after considering all the different systems of collecting fares, and after reaching the conclusion that the positive method, as employed on the elevated railways and subways in New York, was about the surest means extant of getting the receipts in their entirety. With that idea in view the company went to work and applied the elevated and subway system as nearly as possible to the surface cars. To do that, the first thing necessary was to make the rear platform the paying office of the car; that is, that all fares should be collected on the platform. This also had the advantage of keeping the conductor at all times on the rear platform where he could be fully cognizant of what he was doing in starting the car, at which time, Mr. McDonald said, most of the accidents on street railways occur. The system so far has worked very well, and the increased revenue derived from that car, compared to other cars running on the same line on the same days, has varied anywhere from 8 to 15 per cent. This increase is net profit. There was some little opposition in Montreal to the introduction of the system at first, as is the case with all new propositions, and possibly the better an invention is the more opposition develops, but this trouble has now disappeared. In the original car the rear platform was 7 ft. long. In the latest car this dimension has been increased to 9 ft. The 2 ft. extra are greatly appreciated by smokers, and as 90 per cent of the male passengers are smokers it is enjoyed by a large percentage of the patrons. The car is speedy because of the two exits and wide entrance, and the stopping times have been reduced almost by half. Thus if ten people are getting off a car and ten people waiting to get on, ordinarily those getting on have to wait until the ten people are off before they can start to get on, but with this new system the moment the car stops the getting on and getting off begins at the same time. The platforms in question, 9 ft., can accommodate at a rush anywhere from twenty-five to thirty-five persons. The average number of people taken on at each stop will probably not exceed ten persons. In rush hours there may be groups of twenty-five, or perhaps thirty-five, but the latter would be a very rare occurrence in cities of say 400,000 or 500,000 inhabitants. At special corners in very large cities there might be a few more, but in that event the conductor can begin to work at the front and work back and still apply this system of paying-as-you-enter and he will be sure of getting all the fares. There are also moral advantages to the system under consideration, which cannot be properly appreciated except through actual experience, but which indicate that the collection of fares should be made as absolutely certain as possible, so that conductors may not be in doubt as to whether they have received fares from passengers. There is no other system in which conductors do not enter the cars and search for their fares—that is part of their duties. Managers and superintendents of street railway systems have often been under the painful necessity of calling in conductors for "missing" fares. That accusation is a doubtful one. Perhaps the conductor has missed the fares two or three days previous to the time he is called into the office, and cannot remember anything about it. Many managers feel the hardship involved in this matter, knowing at heart the task that they have imposed upon the employee is almost impossible of accomplishment. Even the best of conductors miss fares daily, and the reason that they miss fares is because they have not been provided with a systematic way of securing the fares, and the company should apply all of its energies to furnishing them with a proper method of avoiding this trouble. Two of the cars described will be on exhibition at the Columbus meeting, and the company will also have conductors who have been working on the system there to explain the method of operation fully. As far as the employees are concerned, Mr. McDonald said he could vouch for the fact that all of the conductors are exceedingly anxious to get on a "pay-as-you-enter" car, because it eliminates all contention between them and the public

and cuts out the necessity for the mental diagram which the conductor must make of the passengers in his car, those who have paid and those who have not paid, which is very taxing in a well-loaded car. With all the effort which the conductor may make to discharge his duty honestly in that direction, and with the utmost striving on his part to preserve a true mental record of whether the passengers have or have not paid their fares, it is still impossible for him to accomplish the task now imposed upon him correctly in all respects.

Mr. Fassett then said that he thought that all in attendance greatly appreciated the presence of Messrs. Baker, Barnes and Kennedy of the Railroad Commission, and he suggested that it would be a very good thing for the association in the future to endeavor to have its meetings at such times and in such places as would insure the attendance of one or more of the Board of Railroad Commissioners, or their employees. He then moved that in the case of future meetings of the association, both quarterly and annual, that the executive committee invite the members of the Board of Railroad Commissioners to send representatives, and that so far as possible they make the date and place of meeting such as will coincide with the engagements of the members of the Railroad Commissioners, so that they can be represented.

Motion seconded by Mr. Carver and carried.

BRAKE-SHOES

The discussion then turned to the subject of the cost of brake-shoes per 1000 car-miles. The figures quoted were all based on double-truck cars using eight shoes. Some of the figures given were: 40 cents, 43 cents, 56 cents, 57 cents, 80 cents and $1.10. One member called attention to these widely varying figures, which he thought were due largely to different local conditions. He had found that the weight of the car, the speed of the car, and the number of stops and the number of grades enter very largely into the extent of brake-shoe consumption. Another member called attention to the great difference in wear depending upon whether the shoes were on the motor trucks or on on the trailer trucks.

As regards scrapping, one delegate puts on brake-shoes at 38 lbs., and throws them away as scrap at about 11 lbs. Another puts them on at 24 lbs., and the weight when removed averages 12½ lbs.

SANDING AND SAND CARS

The president then referred to the subject of sand cars, which had been mentioned previously in the discussion, and asked Mr. Hanf what he had in mind when he had referred to them.

Mr. Hanf said that he wished to learn the sense of the association on the value of sand cars, sand on the cars, or both. The Buffalo Company had quite a little trouble last year with flat wheels, which increased just 50 per cent over the winter previous, with the same number of cars. When he looked up the sand records, he found that the sand cars had used 50 per cent more sand than the winter before.

Mr. Fassett said that he believed in sand cars. One of his lines has an 8 or 9 per cent grade for about a mile. This grade is taken care of by men during twenty-four hours in the day, 365 days in the year, and the rails are kept as clean and sweet as a rail can possibly be kept. For the balance of the road, the company tried the sand on the cars, but was always having trouble. The sand boxes were not properly filled at the time they should be filled, and the cars would be taken in off the line to have the sand boxes filled. Finally the company adopted sand cars. The rails of the entire system are sanded on a time table exactly the same as the schedule on which the equipment for the cleaning of snow and ice is operated. The snow plows and sweepers operate on a schedule the same as an ordinary car. The company has snow plows enough to cover the entire system in an hour and a half, and enough sweepers to do the same thing, so that with the worst kind of storms it is possible to get over the entire system in three-quarters of an hour, and it is done on a regular time schedule. The snow plow is supposed to get back to the house at a certain time, and if it does not return at that time it is hunted up. The snow is cleaned from the tracks by starting the sweepers and plows at the time that snow begins to fall, and they are kept going continuously until the snow stops falling. The sanding is done in the same way. When sanding is required the entire city is sanded. Clean beach sand is used; it contains no loam. The sand which is put on is good in the Albany climate for at least five hours under the worst conditions of rail that can occur, so that if the sand cars go over the system twice a day it is possible to keep the rails in very good shape. The sand is dried as thoroughly as possible, but it is impossible to keep it dry because it absorbs moisture when piled up. The only way to do is to put it in a large space and take it as it falls down. Care is taken to put enough salt in the sand to keep the rail in good shape. If ordinary loam sand is used, either in sand boxes or on the cars or in sand cars, the third or fourth car which goes over the rail puts the rail in worse shape than it was before. Since using the present quality of sand in its sand cars the company has not had the same proportion of flat wheels as when the men dumped the sand and then slid the wheels on it. The sand cars are run quite regularly from the 1st of November to the 1st of March whenever the inspectors think them necessary. It is exceptional if the rail is not sanded every day. The sanding of the track is one of the large accounts of the Albany company, greater than the snow and ice removal account, but the hilly condition of the city is such that it pays in helping the company out on Account No. 33. When double-truck cars with air brakes were first put in operation on the Albany line the cars were equipped with individual sand boxes, but these boxes were removed after an experience of about a year.

A delegate asked Mr. Hanf if the weather conditions were not abnormal during the winter when he found a 50 per cent increase in the consumption of sand and a corresponding increase in the number of flat wheels.

Mr. Hanf replied that, on the contrary, last winter was comparatively mild, and he did not see any cause for an increase of 50 per cent in the consumption of sand over the previous winter.

Mr. McDonald said that the Montreal company had never tried the sand car. Sand boxes are used on the cars, and the company has special men for all the heavy grades. There is a large number of heavy grades on the system, varying from 5 to 10 per cent, and on each of these grades the company keeps a sand man for twenty-four hours a day during the bad season, and for about fifteen hours a day during the summer. This was considered the safest thing to do. Not so much reliance is placed upon the sand boxes for the hills as on the men who sand the hills. These men generally keep the hills in order, and the motormen seldom need to use the sand box on the car to sand the grades. The sand box on the car comes into use on the level, in case of an emergency on a slippery day.

SNOW REMOVAL

A delegate asked the Montreal representatives to describe their appliances for snow fighting and the organization of their snow-fighting force.

Mr. McDonald in reply said that for the last twenty-five years the average snowfall in Montreal had been 120 ins. per year. Notwithstanding this large volume of snow the company had not experienced any stoppage of its service for the

past three or four years on any part of its lines, with the exception of some interurban lines, which generally got stalled when the plows got stuck. For its city service the company follows a practice somewhat along the lines which Mr. Fassett had described in regard to Albany. They have a schedule by which a sweeper gets around about every forty minutes, and where the sweeper equipment is sufficient to do this there is little danger of snow blockades. This refers to the track in the city where the streets are built up, with an open space here and there, but no fields. The only thing which the company has found competent to do the business on the interurban lines is the rotary plow. It has some four-motor rotary plows in use now which have given very good satisfaction with the suburban service, and since the inauguration of double-truck rotary plows, with something like 200 hp in power capacity, the company has had no absolute sticking, but the speed of the plows has been greatly reduced at times. In city service the great need in fighting the snow is to start early and gage the probabilities for a coming storm. When the storm arrives, the snow service is started and is increased as occasion may require. If it is a light storm the plows or sweepers get around every hour and twenty minutes, or the number of trips over the road can be increased to any necessary extent. The company takes no chances on snow. It spends somewhere from $150,000 to $200,000 a year for snow cleaning, and finds it pays to be liberal in the allowance for snow fighting, so as to avoid any tying up of the lines. The company is allowed by the city police to use salt on switches and on grades, and as the switches and grades in Montreal are very numerous, this permission means that the company is allowed to use salt almost everywhere. The company has a large number of employees who do not delight in anything as much as fighting a snowstorm, and very little difficulty is experienced in getting them out and getting them to stick at it for as long as seventy-five or eighty hours at a time. During that time the company boards them and feeds them liberally, and while the company has had very little difficulty in contending with a large amount of snow, it has to arrange its plan for fighting the snow with considerable care and at a great deal of expense.

Mr. Fassett said that in fighting snow his company had only one rule—begin early and stay late; begin with the storm and stay with it, and the Albany lines have never been closed on account of snow. He thought the system in Albany of running the sweepers and plows on an absolute time table was quite essential, because then the superintendent or division superintendent knows all the time where this or that plow is. If the plows do not come around in time there are enough others to send out to get them all again on time, but the plows run on a regular time schedule. The company has twelve plows and twelve sweepers for 85 miles of track, and in addition several levelers. Where the streets are wide these levelers are attached to four horses each.

Mr. McDonald said that the Montreal system had a sweeper for every 5 or 6 miles of track. They can go over the entire system in forty minutes.

The secretary called attention to some compilations made last winter from which it developed that the average for all the roads in New York State is 8 miles to a sweeper or a plow, and that sweepers do more effective work than the plows until the snow gets to be 2 ins. or a little over in depth.

Mr. Fassett said that in addition to using the sweepers and plows during the time that snow is actually falling, and immediately after, it is the practice in Albany to run a sweeper over the entire line every night during the winter to sweep out the slush and other stuff that accumulates on the track during the day.

A delegate asked if any company had experienced any trouble on interurban lines with snow in the center of the track after running the snow plow over, and if anything could be done in the way of flanging out the center, as on the steam roads.

Mr. McDonald said that in Montreal an ice-cutter is used for that purpose. It consists of a bent steel bar, which goes under the rear part of the rear truck of a double-truck car. This bar is equipped with teeth set ½-in. apart or so, and this arrangement keeps the centers in good order all the time. This cutter can be set to any height. It is left on the back of the rear truck all winter, and keeps the road in good shape all the time. It is hung on springs, with the teeth made of 5-in. tool steel, with the teeth set in.

Mr. Collins said that his company uses a flanging device on its snow plows which takes care of this snow. This device throws all the snow and ice out into the roadway.

Mr. Graburn in further explanation of the Montreal cutter said that when ice accumulates after a snow storm the company tries to arrange each car so that the teeth on one car will cut out what the preceding car leaves. With fifteen or twenty cars equipped on any line with these bars it was possible to keep the line in good order all winter. No attempt is made to take the loose ice out.

Mr. Graham said that in Buffalo considerable trouble was experienced with the high snow centers, until the company got two ice-cutting machines, each with a row of diamond-shaped teeth. These cutters were applied to the bottoms of some trucks and four horses would take a trip over the lines and cut out the high ice centers.

BRAKE TESTS

Mr. McDonald said that he thought it would be very useful for the association to determine the distance within which a car could be stopped under favorable conditions, and what distance would be considered was a good stop. Such information would be very valuable in accident cases. The subject might also be considered by the American Association.

Mr. Fassett said that in 1896 he had made some tests on that point. He took a car and ran it at 8 m. p. h., and the best stop he could make was 45 ft. He then had every motorman on the lines of the Albany Railway Company make a test stop, and recorded the results, and for ten years has not had any trouble. Every motorman in court who said what he could do was confronted with what he had done under the most favorable conditions. The Railroad Commissioners also made a series of tests. Their report is published and shows practically the same results as reached in Albany. Mr. Fassett thought that the best method of convincing people with what they could do was a demonstration of the length of time in seconds it took them to go through the motions of stopping a car. With a car running 8 m. p. h. or going 12 ft. a second, about 4½ seconds was the very best they could do before the court in showing what motions they had to go through in order to stop the car, throwing off the power, etc. By following this plan with all of his men he has practically eliminated from negligence cases any erroneous testimony which may be given by expert ex-motormen. The tests referred to were made with a single-truck car both with reversing and with brakes, but it was after this series of experiments had been made that the company changed its rules and did not allow the men to reverse the car at any time to avoid an accident, except in cases of a breakage of the braking apparatus. When the car got up to a speed of 12 m. p. h. the gears would come out in reversing, and in one case where the car was running 20 m. p. h. the bottom of the car was taken out. The track on which the tests were made

was practically level, that is, it had a grade of only 3 ins. in 100 ft. Mr. Fassett said that he did not believe a man making a stop with an emergency application could beat the stop which can be made on a single-truck hand-brake car by more than 5 ft.

Mr. McDonald suggested that tests be made with different weights of car, speed, grade, and under all conditions which are likely to occur.

Mr. Peck moved that the matter be referred to the committee to be appointed on brakes and braking and that a report be presented at the next meeting. Carried.

CONCLUSION

After a vote of thanks to the United Traction Company, of Albany, and General Manager Fassett, who were the hosts, the meeting adjourned.

BRAKING FOR ELECTRIC CARS *

BY GEORGE C. GRAHAM,
Superintendent of Car Equipment, International Railway Co., Buffalo

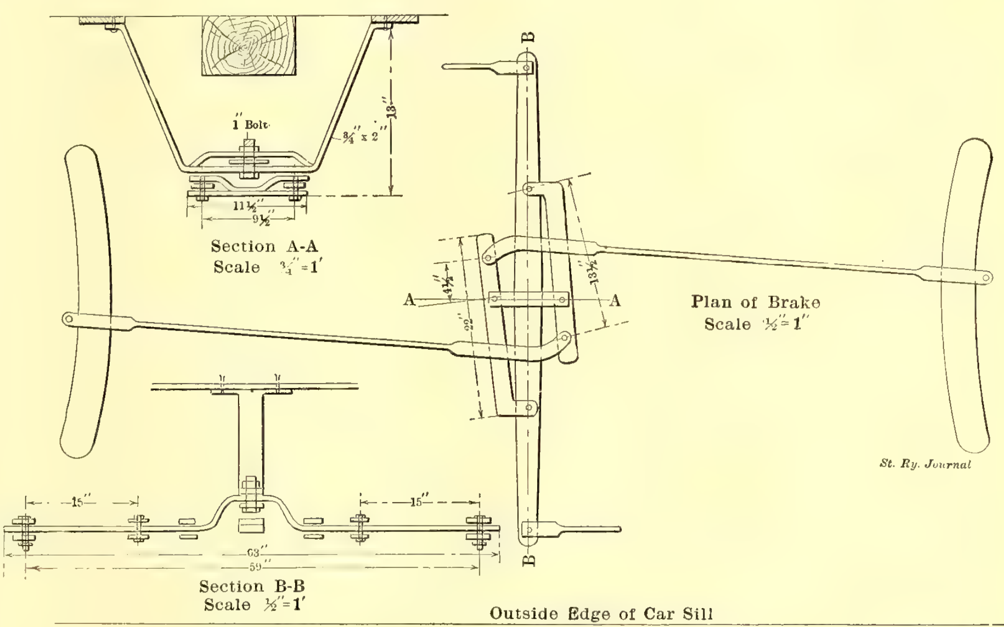
The question of what is the proper system of brakes to be used and how to apply them on the heavy four-motor cars that are being built to-day for both city and interurban service, and principally operated as single cars, is one of great importance and is worthy of the attention of all street railway companies. During the evolution of the street car brake, as in the case of nearly every mechanical appliance, much has been learned respecting its operation, and the strong or weak points gradually discovered. Practice would seem to demonstrate that up to this time no system of braking has yet been devised which can properly be compared with "straight air" for cars operated through city streets.

This system gives the motorman a quick, safe and easy control of the car without any exertion on his part, and his preference for this system can easily be seen where hand, electric and air-brake cars are operated over the same lines. I have known motormen who would invariably turn in either a hand or an electric brake car, reporting some imaginary trouble, if they thought there was any possibility of getting a car equipped with air brakes to replace it. Where the lighter cars equipped with hand brakes are operated over the same line as cars equipped with air, it is absolutely necessary that the hand brakes be kept in the best possible condition, to allow the motorman to make his stops properly without much labor on his part, and still keep out of the way of cars which are being operated with air brakes. In this we are greatly assisted by the use of the gear drum or eccentric wind-brake staff, which not only makes it easier for the motorman, but is quicker and safer than the old method of bolting the chain through the bottom of the staff, which was the practice some few years ago.

* Paper presented at the Albany meeting of the New York State Street Railway Association, Sept. 19, 1906.

At present we are operating over the different lines of the International Railway Company, in the city of Buffalo, cars equipped with hand, hand and electric, and hand and straight air brakes. On cars equipped with both electric and hand brakes the electric brake is used exclusively; on cars equipped with air and hand brakes the air brake is used exclusively, except between the hours of 10 and 11 a. m., during which time the motormen have orders of operate hand brakes. This not only gives the motorman an opportunity to ascertain the condition of these brakes and report thereon, but also keeps the staffs and gears from rusting and clogging up with dirt, preventing them from being set up and releasing properly. The high-speed cars in interurban service have designated stops to make daily with the hand brake.

Our largest car operated with the aid of hand brakes only is 34 ft. long, weighing approximately 11 tons, with a seating capacity of 34 persons. These cars were originally equipped with double chains with ⅜-in. links, connecting ¾-in. brake rods, and attached to brake lever through reinforced ends by ¾-in. key bolts. The chains wound on sprocket by gear on brake staff would, at times, on some of our lines, clog up with ice during the winter months, making it impossible to set the brakes, or when set, very difficult to release them without getting off the car. To overcome this trouble we



EQUALIZING BRAKE IN USE WITH BRILL M. T. TRUCK

have discarded one chain on this type of wind on these cars. The results of this plan have been very gratifying, and we have never known of an accident due to the breaking of the brake chain. This brake rigging is giving good satisfaction, but on account of the use of maximum traction trucks there are times, owing to weather conditions, when the brakes are set up, that the wheels of the rear truck will slide somewhat, not only causing numerous flat wheels but also rendering cars rather difficult to control. This is mostly eliminated, however, by an equalizing device, installed by a former employee, which is illustrated herewith and has proven very efficient. This device not only does away with flat wheels, but also facilitates the control of the car by the working of brakes simultaneously on both trucks at all times. We have several cars equipped with this equalizer, which have been in service over four years, and we have yet to find a flat wheel on any of them.

The cars equipped with electric brakes are 39 ft. over all,

weigh about 14 tons, and have a seating capacity of 40 persons. We have always found this type of brake reliable in stopping car, but it is the cause of more motor trouble than the same equipment operated with air brakes. It has also been found the source of many protests from the patrons of the road, due to the disagreeable jerking of the car when making an ordinary service stop. This trouble has been considerably lessened by changing from ribbon to gridiron rheostats, for by the use of these rheostats better results have been secured and only half the number is required. These cars are operated over several 4 per cent grades and the hand brakes are in use continuously in stopping and holding cars while operating thereover.

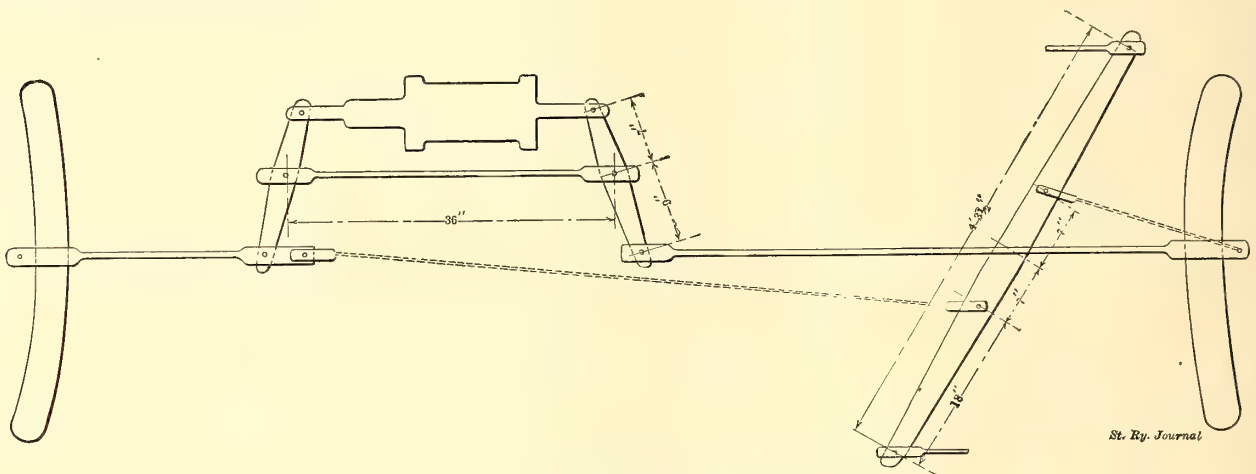
The city cars equipped with air brakes vary in weight from 13 tons to 25 tons, and range in length from 36 ft. to 45 ft., having a seating capacity of 30, 40 and 44 passengers. The hand brakes on these cars are attached to a gear drum with an eccentric wind at the brake staff by the use of single flat chain with 7-16-in. link. The rods running back to floating lever, which is independent of air brakes, are ¾ ins., straightened out at bends necessary to avoid motors, from ¾ ins. round to 1½ ins. x ½ in. flat; these rods connect at lever by ¾-in. key bolts. The 13-ton cars carry from 45 to 55 lbs. of air, and the 18-ton cars, which at times are operated with trailers, carry from 50 to 65 lbs. of air.

Our interurban high-speed cars are 44 ft. over all, weigh approximately 27 tons, and have a seating capacity of forty-eight persons. These cars are run at a speed of 50 miles per hour and make a great many stops. When some of the older type trucks were first put in service we experienced more or less trouble on account of the breaking of brake rods where they go through the brake beam, due to the pull not being in a direct line; and this was also found to be partly the cause of the shoes not wearing true on the wheels. It was found that trouble from this source could be eliminated altogether by removing the adjusting bolts on the release springs, running the springs through slots in the brake-head, upsetting the clip that fastens the brake rods to the brake beam and bolting same on the under side, giving the rod a straight pull and allowing the brake-shoes to bear true on the face of the wheels. The working of the hand brakes on these cars is practically the same as on the heavy city cars, but on account of being operated in three-car trains during the heavy travel, should there be necessity for additional braking, in case of air giving out, the motorman can, by a signal from his whistle, notify the conductor to set up hand brakes on all the rear cars. The air pressure on these cars cuts in at 55 lbs. and out at 70 lbs., being controlled by train line governor with balance wire connecting governor on all cars. During the three years that these cars have been in operation we have never experienced any difficulties other than that mentioned. Close inspection, of course, must be given to hose connections, key bolts in brake lever, and minor parts. On cars equipped with multiple control, the air hose couplings, owing to their high position on vestibule front to allow cars to curve, have considerable wear close to the elbow, and if not closely watched are liable to burst. The key bolts show more evidence of wear than any other part of the brake rigging, and often when the bolt is apparently in good condition it will be found, upon examination, to be almost sheared in three pieces.

Great benefit is derived from the practice of sparing no time or trouble in instructing motormen regarding the proper use of all brakes. By adherence to this method the life of equipment is materially lengthened, and the traveling public is afforded a smooth and pleasant ride.

There is a bad practice prevalent among new motormen—one in which they seem to delight—but which cannot be discouraged too quickly, of causing air brakes to exhaust constantly. While making an ordinary service stop these men will manipulate the air handle from the emergency position to the release, thus keeping the air compressor constantly in operation.

Another point which should be firmly impressed upon the minds of motormen is the manner of making an emergency stop by throwing the controller into the reverse position in the event of the operating brakes giving out. It has been found that motormen thoroughly familiar with their duties experience little trouble in retaining control of their car by either the air or hand brakes, or reverse lever, should one or the other fail to operate from any cause.



AIR AND HAND-BRAKE ON 13-TON CAR

DIFFERENT SYSTEMS OF BRAKES *

BY H. S. WILLIAMS,
Assistant Electrical Engineer Utica & Mohawk Valley Railway Company

With the growth of electric traction, the question of brakes has become a matter of deep importance, and as the present development tends toward the equipment of electric cars with multiple-unit control which will allow them to be operated either singly or in trains of any length, this paper will be devoted almost exclusively to a description of the systems of air brakes adaptable to this class of service. The conditions to be met in train operation are varied, due to local requirements, and several different systems of air brakes have been

* Paper presented at the Albany meeting of the New York State Street Railway Association, Sept. 19, 1906.

developed to meet these conditions. The principal requirements are reliability and ease of operation, simplicity of parts, economy in the use of air, ability to make repeated application and release in rapid succession and still be in condition to meet an emergency. The brakes should respond quickly to the controlling mechanism and the release be graduated in such a manner as to make a smooth stop possible.

The first system to be considered is the operation of two-car trains, one car being equipped with motors and the other a trailer which is used only during hours of heavy traffic. To meet this condition a modification of the familiar straight air system is used. This modification consists in arranging the system so that in event of a break in the air pipes or similar accident the brakes will be applied automatically, and in an emergency a quicker setting of the brakes can be secured than would be possible by use of straight air alone. To accomplish this, a small triple valve and a second train line with the necessary hose couplings is added to each car. This triple valve operates only in case of emergency. The method of operation of this system is as follows: The main reservoir pressure is maintained in the slide valve chamber of the triple valve and its position is held in such a manner that it will not travel without a material difference between the pressure on one side and that on the other. The motorman's brake valve is so designed that under ordinary conditions application and release are made in the same manner as with plain straight air, and in service applications no reduction of pressure is made in the second train line. In an emergency, however, or with a rupture of the train line, the pressure is reduced sufficiently to operate the triple valve, thereby setting the brakes quickly by means of pressure in the second train line. A second advantage gained in the use of this system is preventing the motorman from wasting air by using the emergency for ordinary stops. In case of his doing so, it would require so long to get a release of the brakes that he would soon give up the practice.

Another phase of train operation is found in two-car trains having a motor car and trailer but differing from the operation just described in that the trailer is run continuously as part of the train. As there are but two cars, it is possible to use a type of automatic air which has the straight air release and a quick recharge feature in the triple valve which allows the application to be made in rapid succession without too great a decrease of pressure in the auxiliary reservoir. In this type of brake no graduation is made at the triple valve, but this is accomplished by piping the exhaust from the brake cylinder of the motor car to the brake valve. This brake valve differs from the ordinary type in having two distinct release positions, motor car release and trailer release. In making a stop, air is applied to the brake cylinders (as in any type of automatic brake) by a decrease of pressure in the train line. To effect a release the brake valve handle is moved to release position, which recharges the brake pipe and auxiliary reservoirs and sends the triples to release position, thereby discharging the brake cylinders on both cars, but as the exhaust from the motor car brake cylinder is piped back to the motorman's valve, pressure is retained in this cylinder. Now by moving the brake valve handle to its second release position this pressure is allowed to exhaust into the atmosphere and the release may be graduated as with straight air. With this system, in order to accomplish a smooth braking, the motor car must be given a relatively higher braking power than that given the trailer, so that when the brakes are applied any slack that may exist between the motor car and trailer will be taken up and the consequent easing up necessary to make a smooth stop will not cause any "chucking" between the cars.

The next system is one which is applicable to two or three-car trains consisting of either all motor cars or motor cars and trailers. This is a condition met in multiple-unit equipment. For such use an automatic system is essential. With it the graduation of application and release are made at the triple valve through the medium of a slide-valve graduating valve. To obtain prompt response of the brakes, feed-valve pressure rather than main reservoir pressure is maintained on top of the rotary valve, quick recharge triple valves are used and reservoirs of rather small volume employed. The maintaining of feed-valve pressure on top of the rotary valve also has the advantage of preventing an overcharge of the train line. While the triple valve used has the feature of allowing a quick recharge of the auxiliary reservoir, it is not strictly a quick-action triple. With this system the exhaust from the brake cylinder on the first car of the train can be piped to the brake valve as previously described and the feature of straight air release on the head car thus obtained. This point is desirable in case cars are to be operated in single units as well as in trains. For a train line, either one or two pipes can be employed. With a one-pipe system the compressors work entirely independent of one another and the labor is very evenly divided between them. If a mixed train of motor cars and trailers is used, a second or control pipe should be added to equalize the labor between the compressors and provide a source of air supply in case the compressor in the front car fails. With a single train line, a failure on the part of the compressor on the head car would force the motorman to go back to the next car having a pump in order to operate his brakes.

The next system to be taken up is the handling of trains composed of four or more cars. As the length of the train increases so does the necessity of a quick-acting triple, owing to the relatively slow flow of air through a long train line. A graduated release and quick recharge are also important items. This system is similar to that used on steam roads, but owing to the fact that the motor cars in the train are complete units in themselves, a smoother operating brake and a more flexible system may be obtained than is possible where the main reservoir and pump are located on the head car only. With this equipment, straight air release may be secured on the head car, if desired, in the same manner as previously described. A refinement has been recently added to this system called the "quick-service feature," which is an improvement on the quick-action triple. This is an arrangement of the triple valve ports in such a way as to combine brake pipe pressure with the auxiliary reservoir pressure and so accomplish a quicker changing of the brake cylinder and consequently quicker application of brakes. This method has heretofore been used only for the emergency application, but with its use in service application the time of serial action of the brakes throughout the train has been reduced about one-half. This permits a smoother handling of long trains. For reasons previously mentioned this system can be operated with a single train line or a double line consisting of brake pipe and control pipe.

Another condition, though one less frequently encountered in electric service, is in handling trains by one motor car or an electric locomotive. This is found in the handling of freight cars or non-motor passenger cars. Under such conditions the compressor, brake valves and main reservoir are on the motor car. On the trailer cars the only equipment needed is a single train line and the usual auxiliary reservoir, brake cylinder and quick-action triple, the brakes being operated in the customary automatic way, and the chief feature distinguishing this from the other systems being an

arrangement of a second motorman's valve whereby the brakes on the motor car may be operated together with the train brakes or independent of them.

The most recently developed system and the most interesting one from an electrical standpoint is known as the "Electro-pneumatic System." This is not essentially a braking system, but rather an improvement in the method of operation of air brake valves, and may be adapted to any of the braking systems described. It is not designed to do away with pneumatic operation of the brakes, but is a refinement supplementing this method of control. The apparatus needed to accomplish this is a number of electric contacts arranged on the motorman's brake valve, electrically operated application and release valves, switches for cutting out the current used in the operation of the magnets, a two-line electric circuit through the car with necessary sockets and flexible couplings to connect with other cars, and a rheostat of sufficient resistance to allow a flow of about one ampere of current to be used for the opening and closing of the electric valves. The electric portion of the brake valve is a series of electric contacts used in the pneumatic release position and does not interfere with the operation of the equipment by means of air. Thus, if the electrically-operated devices fail, the train can be handled by means of the automatic brakes and without interruption. In other words, the pneumatic side of this equipment is left intact and is in reserve for immediate use. The operation of this device in connection with automatic brakes is as follows: The electric contacts on the brake valve being operated in the pneumatic release position, as stated before, the triple valves are therefore in release position, the auxiliary reservoir charged, and the triple valve exhaust open to the atmosphere through the electric release valve. Upon making an application, the first point reached completes an electrical connection through the release magnet energizing it and thus closing the brake cylinder exhaust. The second movement of the handle closes another connection which operates the magnet on the application valve, opening this valve. This operation allows air to flow from the auxiliary reservoir through the triple valve exhaust into the brake cylinder. As long as the handle is held in this position air will flow into the brake cylinder. To stop this flow it is necessary to move the handle back slightly, breaking the circuit which holds the application valve open, thus closing it. This forms a lap or holding position. Moving the handle back to its original position allows the release valve to open, exhausting the air pressure from the brake cylinder. During all the movements of the electric operation, the brake valve is in the pneumatic release position. Consequently the recharge of the auxiliary reservoir goes on continually. So it will be seen that successive application and release may be made without depleting the auxiliary, and any desired fineness of graduation obtained. With this style of equipment no movement of the triple is necessary and the operation is practically that of straight air on each car. As the valves are operated by electricity, the time element, which is such a prominent factor in automatic air brakes, is done away with and the brakes on all the cars work simultaneously. This system is not only simple and efficient, but is very economical in regard to quantity of air used, owing to the fact that it is not necessary to partially exhaust and recharge a train line.

This type of equipment has been given a thorough service trial, and the results are such as to warrant its further adoption. In fact it would seem that the electro-pneumatic system is the best ever developed for electrical railway service where train operation is contemplated, and its extensive adoption for this class of service can be only a matter of time.

DIMENSIONS OF CAR BODIES FOR CITY SERVICE *

BY H. GERON,

Manager of the Cologne Tramways Company, in Liquidation

City car bodies must be designed not only with the purpose of providing for the comfort of passengers during transportation, but also for facilitating their rapid entrance and exit. In this respect city car design differs from both interurban and steam railroad car design, where the former factor is more important and the entrance and exit of passengers is less continuous. To secure this latter object it is not sufficient simply to have large platforms and large doors, the aisles should also be wide, especially near the doors. Who has not had the disagreeable experience, when boarding and leaving a car, especially in wet weather, of being obliged to push through a narrow aisle, crowding against the knees and squeezing past the umbrellas of seated passengers? When operated by horses the speed of street cars was so slow that the question of length of the stops did not constitute so important a factor in operation. Moreover, the cars were very much smaller and there were fewer people to crowd the entrances at stops.

The replies (108 in number) from members of the association to the questions submitted by the writer indicate that the width of the cars in most cases is set by the municipal authorities, but that the length, height and other dimensions are usually left to the company. The replies from the city roads proper show that the greatest width permitted varies from 2 to 2.2 meters (6 ft. 6¾ ins to 7 ft. 2½ ins), that in some cases a width of only 1.95 m (6 ft. 4¾ ins.) and even of 1.9 m (6 ft. 2¾ ins.) has been allowed, while in other cases, especially where the question of cross seats and other conditions were at stake, a width was authorized of 2.35 m (7 ft. 8½ ins.), and even of 2.40 m (7 ft. 10½ ins.). Practically all of the companies state that the maximum widths mentioned were imposed by the authorities on account of the narrow streets and to interfere as little as possible with the general traffic circulation in those streets.

The maximum widths usually permitted are 2 m, 2.1 m and 2.2 m. It might be remarked here that this difference of 10 cm to 20 cm. (4 ins. to 8 ins.) between these dimensions has very little effect upon increasing or diminishing the vehicular capacity of the street, but is of the greatest importance so far as car design is concerned. These narrow widths explain the general arrangement in city cars of longitudinal seats, while later tramway companies, which have secured the right to employ a wider car, have installed cross seats. The replies also indicate that the companies generally prefer cross seats if they are permitted by the width of the car, and that such seats are more popular with the public, especially for long rides.

The aisle has generally a width of 800 mm (31½ ins.) in case of longitudinal seats and 500 mm. (19¾ ins.) in the case of cross seats. In practice this width varies between 800 mm and 1 m (31½ ins. to 39¼ ins.) for the longitudinal, and between 450 mm and 600 mm (17¾ ins. to 23½ ins.) for the cross-seated cars. In this connection some interesting information contained in the replies will be quoted.

The exterior width of the cars of the Grosse Berliner Strassenbahn is 2 m (6 ft. 6¾ ins.) except for open cars with running board, where the extreme width is 2.2 m (7 ft. 2½ ins.), and for cross-seated convertible cars, where the width is 2.15 m (7 ft. 1½ ins.). The aisle varies between 800 mm and 830 mm (31½ ins. and 32½ ins.) for longitudinal seated cars and between 500 mm and 520 mm (19¾ ins. and

* Paper presented at the Milan meeting of the International Street and Interurban Railway Association, Sept. 17-22, 1906.

20½ ins.) for cross-seated cars. Wider dimensions could not be secured without increasing the space between the tracks, as otherwise the cars would hit on curves. In Brussels the maximum width permitted is 2.2 mm (7 ft. 2½ ins.), including the running board on the open cars. The width of aisle with cross seats is 450 mm (17¾ ins.). The longitudinal-seated cars are 2.05 m (6 ft. 8½ ins.) wide and have an aisle 785 mm (31 ins.). In Cologne the width is 2.10 m (7 ft, ½ in.), with an aisle 840 mm (33 ins.) and 510 mm (20 ins.), according as the cars have longitudinal or cross seats. Other widths are: Riga, 2.10 m (6 ft. 10½ ins.); Dresden, 2.15 m (7 ft. ½ in.); Amsterdam, 2.08 m (6 ft. 9½ ins.); Frankfort, 2.06 m (6 ft. 9 ins.); Antwerp, 2.20 m (7 ft. 2½ ins. While most of the companies would like to have a wider car they are not able to do so on account of the narrow distance between the tracks.

In conclusion the writer recommends that in the case of new lines every effort be made to secure widths of at least 2.10 m (6 ft. 10½ ins.), and that streets which do not permit this width be avoided except in case of absolute necessity. Where the width of the car is absolutely obliged to be limited to 2 m (6 ft. 6¾ ins.), every effort should be made to utilize to its fullest extent the available interior width of the car, by cutting down outside and inside projections such as steps on the outside, moldings, etc.

POWER-GAS PRODUCERS IN STREET AND INTERURBAN RAILWAY WORK *

BY E. A. ZIFFER,
President of the Bukowina Railway Company

Gas producers can be divided into three classes, viz: pressure producers, or those in which a gas mixture is pumped into the producer by an injector or centrifugal blower; suction producers, or those in which the motor sucks the gas from the producer and then, due to the pressure, new mixture is drawn into the producer; and combined pressure and suction producers.

The suction gas producer does not require a steam boiler, a gas regulator nor a gas meter; it takes up less space than the pressure type, it runs without noise, it cannot explode, and is absolutely odorless. For the above reasons the author considers it alone in his report.

Questions addressed to the members of the association were answered by forty-three companies; twenty-one did not use power gas with the suction producer; the remaining twenty-two answered by sending descriptive booklets of their plants.

The composition of standard power gas is given as follows:

	Volumes
Carbon dioxide CO_2	5 to 7
Carbon monoxide CO	20 to 26
Hydrogen H	17 to 20
Nitrogen N	47 to 53
Hydro carbons C^mH^n	1 to 3

One kilogram of combustible, according to its quality, should produce from 4.5 to 5 cubic meters of gas having a heating value of from 1100 to 1350 calories per cubic meter. This amount of gas will require from 1 to 2 kilograms of steam.

The efficiency of the combustible is given as about 80 per cent; the thermal efficiency, according to Dowson, is given as about 30 per cent, and the efficiency of the producer is given as 90 per cent; the corresponding efficiencies for the steam boiler are only 15 and 70 per cent.

A table comparing the annual operating expense of different kinds of power is given, as follows:

	25 hp-year $	25 hp-year %	100 hp-year $	100 hp-year %
Electric motor: power 2 cents per kw-hour; efficiency 98 per cent; interest and depreciation 7.5 per cent.	1,050	100	4,170	100
High speed engine: 2.25 kg coal per hp-hour; coal $3 per ton; 18 liters per hp-hour at 5 cents per 1000 liters; wages $4.80 per week; interest and depreciation 10 per cent..	868	82.7	2,490	59.6
Gas motor: 0.46 cu. m illuminating gas per hp-hour at $1.86 per cu. m; interest and depreciation..........	694	66.1	2,320	55.6
Gas motor (Dowson gas): 0.45 kg coal per hp-hour at 4 cents per cu. m; wages $1.26 per week; interest and depreciation 10 per cent...........	347	33.1	1,194	28.6

The advantages of power gas installations are: low fuel consumption, simplicity of operation, complete utilization of the fuel, high calorific power, production of power at a cost of less than 40 per cent of that produced by the best steam engines.

At the end of his report the author mentions the Diesel motor, and gives the following advantages: requires no gas producer; burns cheap liquid fuel, such as crude naphtha, petroleum residue, crude alcohol; is always ready to start; requires no fuel when not in use; is perfectly safe; is easily attended; is durable, noiseless, odorless; has no sparking apparatus; is automatic and very economical (0.48 cents per hp-hour).

In an appendix is given a bibliography and a list of the electric railway companies which are operating their power houses with power gas.

MAXIMUM SPEEDS ON CITY AND INTERURBAN RAILWAYS*

BY E. KRASA,
General Inspector of the Bukowina Railway Company

Sixty-one interurban railways, operated mostly by steam, replied to the inquiries addressed them. Of these, thirty-seven with a combined length of 2800 km (1750 miles), had a standard gage, and twenty-four with a combined length of 3709 km (2318 miles) had narrow gage. Many of these interurban lines are used largely for light freight. The speeds are usually fixed by the Government. Thus, in Italy no interurban road can run cars at a higher speed than 30 km (19 miles) per hour, unless all the cars are braked. The Swiss law is the same, except that the maximum speed permitted is 40 km (25 miles) per hour. In most of the other countries the limit is 30 km.

Fifty-nine tramways with a total length of 2181 km (1363 miles) replied to the inquiry. Of these, twenty-seven with a length of 1391 km (870 miles), had standard gage, and thirty-two with a length of 790 km (490 miles) had narrow gage.

The conclusions of the author for interurban speeds are:

1. On a right of way 30 km to 40 km (19 to 25 miles) per hour, increased under favorable conditions to 50 km (32 miles) per hour.

2. In open country 30 km to 35 km (19 to 22 miles) per hour.

3. On fairly open highways 15 km to 20 km (8 to 12½ miles) per hour.

4. In congested streets 10 km to 15 km (6¼ to 8 miles) per hour.

For tramways the writer recommends as maximum speeds:

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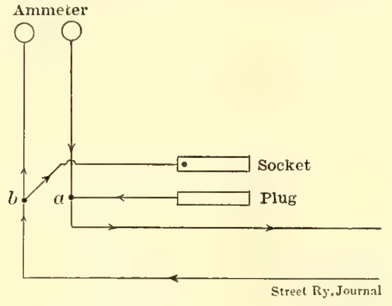
1. On right of way 30 km to 40 km (19 to 25 miles) per hour.
2. In open country 25 km to 30 km (15½ to 19 miles) per hour.
3. On fairly open highways 15 km to 20 km (8 to 12½ miles) per hour.
4. In congested streets 10 km to 20 km (6¼ to 12½ miles) per hour.

PRACTICAL SHUNTING KINK

BY HENRY SCHLEGEL

Having occasion to run watt-hour absorption tests on a 200-hp railway motor equipment, with voltmeter and ammeter, and the largest capacity of ammeter available being a 400 amp. Weston instrument, it was necessary to temporarily increase the current indicating capacity by means of an improvised shunt. The resistance of the meter was only .00063 ohm, so that the cross-section of conductor required to bypath the meter alone would have been unwieldy and the adjustment impracticable with the facilities at hand. The successful plan adopted was as follows: Two pieces of No. 4 B. & S. flexible cable, each 4 ft. long, were tapped at their middle points as indicated in the diagram. Both ends of the tapped cables were trimmed and tinned; one end of each cable was connected to the ammeter. To the free end of the *a* cable was soldered 8 ins. of ¾-in. brass rod, which was to serve as a plug; to the free end of the *b* cable, was soldered 8 ins. of ¾-in. seamless brass tubing to serve as a socket.



ARRANGEMENT OF SHUNT TO ADD TO AMMETER RANGE

The plug and socket telescoped each other snugly, but both were thoroughly cleaned and tinned to insure a perfect contact at the sliding joint. The resulting fit was so good as to require a small hole to be drilled in the tube before the plug could be inserted against the resulting air cushion. As the 4 ft. of cable leading to the meter was just electrically balanced by the 4 ft. of cable in the shunt, the duty of the sliding joint in the shunt was to admit an adjustment that would just balance the meter resistance and to serve as a switch for opening and closing the shunt circuit to note its effect on the ammeter reading.

The adjustment was tedious, as it was made on a railway circuit of very changeable voltage; it was effected as follows: The plug was run into the socket as far as it would go; the current through shunt and meter was then regulated until the meter reading was approximately 150 amps. on withdrawing the plug, the meter reading increased to approximately 300 amps. The final adjustment consisted in so proportioning the amount of engagement between the plug and socket, that withdrawing the plug would double the meter reading and inserting the plug would halve the reading; this condition secured, the indicating capacity of the instrument would be doubled and the total current flowing at any time would be twice the meter reading. After considerable trial and patience, three readings were obtained—one on withdrawing, one on reinserting, and the third on again withdrawing the plug from the socket—this set of three readings being taken to insure that the current did not change in value during the final adjustment. A higher reading ammeter, two ammeters in parallel or a wattmeter would have saved much trouble, but none of these was available within the time limit prescribed.

The adjustment was checked with a high-reading meter after the test had been run and found to be sufficiently close for the purpose in hand. It was not absolutely necessary that the multiplying power of the shunt should be a whole number 2, but by taking a little more trouble to have the multiplier a whole number, much calculation labor was saved in the subsequent handling of the 1200 current readings taken. It may be remarked that two ammeters in parallel will not indicate current equal to the sum of their capacities unless the resistances of the meters have the inverse ratio of their capacities; of course they can be made to share current in any desired ratio by manipulation of their binding posts, but with heavy currents flowing more than a short while, this is not recommended.

THE REMOVAL OF CAR WHEELS

BY JAMES ANDREWS

In considering the subject of the accidental diseases of car wheels, it is essential that the causes for the removal of these parts should be watched with the utmost care else defects due to bad adjustment or operation may be hidden beneath the data of otherwise good results. For example, there may be a chronic condition of defect on a certain line of cars that is productive of sharp flanges or flat spots, yet the average mileage made by all the wheels in use may be high enough to satisfy the management. It should be borne in mind, then, that these things do not happen without due cause, and that a painstaking investigation will eventually get at the root of the matter and the remedy will be suggested.

An illustration of this is afforded by the experience of a large road that was afflicted with flat wheels to an alarming extent. In fact, a car without a flat wheel was an exception to the rule. Casual inspection detected nothing out of the way, but an investigation developed the fact that the foreman of each house was a law unto himself in the matter of brake leverages, and when the cars were delivered from the main shops the first complaint of a motorman as to bad braking qualities caused a change to be made that would render the skidding of the wheels not only very easy to accomplish but very difficult to avoid. The standardization of the brake rigging and the issuing of order prohibiting any changes in it at the car house put an effectual stop to the production of flat wheels; and, while under the former conditions the shops were crowded with the removal and grinding of slid-flat wheels, months now frequently pass without a single one being reported.

An examination of the records of this same road shows that, for cast-iron wheels, there are practically but two causes for removals: worn out and chipped flanges. This latter is so common on all roads and has been so frequently alluded to in these columns that the reader will at once attribute the difficulty to the true cause, the riding of the cars on the flanges at the special work. Here the road department is profiting at the expense of the equipment, but it is quite evident that the stockholders are not profiting to the same extent, for, from the same pocket into which the special work savings are placed must be paid the extra cost of chipped flanges. Now, whether there is a saving left after these payments have been made is an exceedingly difficult question

to answer, and can only be settled after a long investigation; for chipped flanges are produced by other causes than riding over special work, and there is no known means of ascertaining how it is caused from an examination of the wheel.

Possibly a solution of the trouble might be found by cutting the Gordian knot instead of attempting to untie it, and so using steel wheels that do not chip in the flange even though they are called upon to carry the whole weight of the car and be subjected to the inevitable blows at special work crossings.

From what has been said it would appear that on one road, at least, wheel troubles have been reduced to exceedingly narrow limits when removals are made solely because the wheels are either worn out or have chipped flanges. The first is inevitable and must come in time to the very best of wheels, and the veriest tyro can diagnose the cause for the latter.

If, then, a large road operating thousands of cars over hundreds of miles of track, with all sorts and conditions of rails, crossings and switches, can reduce wheel removals to this point, it does seem that other roads of the same or smaller proportions could go and do likewise.

If we turn to the records of the steel wheel removals, we find another set of conditions prevailing. The chipped flange has given way to the sharp flange. This is a more insidious trouble and proportionately more difficult to analyze because it may be the result of a number of causes. In fact, it may even happen that a flange runs sharp on one wheel when the cause is not in itself or its mate but in the other pair in the same truck.

A sharp flange is really about the most expensive thing that can happen to a steel wheel because it is the direct cause of a loss of metal out of all proportion to the mileage and the normal wear.

A wheel may be quite true on the tread and evenly matched with its mate and yet need to be turned smaller by from ⅜ in. to ¾ in. in diameter, in order to build up the standard flange again. This is a waste pure and simple and emphasizes the desirability of closely inspecting wheels for sharp flanges and not allowing them to run too long, as the amount of metal to be removed increases with the degree of sharpness that has been attained. In the case of fifteen wheels recently examined at random that had been turned for sharp flanges, the loss of metal due to turning averaged 0.85 in. per wheel in diameter, while that due to wear was 0.93 in. This 0.93 in. of wear represented an estimated average mileage of 37,396 made in an average of 207 days each. Assuming the rate of wear for the turned-off metal to be equal to that actually worn, the normal life of the wheel is divided almost in half, and if the thickness of the tire is such that 3½ ins. of diameter can be removed before scrapping, such a wheel, by a repetition of the sharp flange, it would have its life cut down to 73,670 miles made in 408 running days instead of 140,500 miles made in 779 days as might reasonably be expected. To this loss of material and service must be added the cost of wheel removals and turning and that of the car earnings while idle, so that, upon the whole, it is easy to realize that sharp flanges on steel wheels are an expensive luxury.

It may be said that, in any discussion, by a careful selection of the items given in the statistics available, almost any point in a controversy can be proven. So, in the case of wheel removals, it may readily be made to appear that the cast-iron wheel of to-day is a very inferior article to that of a dozen years ago. It may be true that a longer life and a greater mileage was obtained then than now, but it is well known that the requirements of the service are more severe now. It may be that a better wheel than is now being furnished can be made at a higher price, and it is patent to all that cost is increased by the use of an inferior wheel. At the same time we are gaining in knowledge all of the time and are better prepared to care for the wheels that are used and get the highest possible mileage out of them.

As an example of this improvement in running conditions, though the comparison is admissedly not exactly fair, though to which road it is unfair it would be difficult to say, take the table of the causes of a few wheel removals published in the STREET RAILWAY JOURNAL for May and August, 1895. In one case 28 per cent of all wheels removed were for sharp flanges, and in another 6 per cent slid flats were 10 and 46 per cent, respectively. Chipped and broken flanges were 6.8 and 26 per cent, while the worn out were but 6.8 and 3 per cent respectively.

Now, if on a given type of car and truck the wheels removed can be classified as worn out or chipped flange and that the two stand in the relationship of 63.33 per cent of the former and 36.67 per cent for the latter, as has been done, it certainly looks as though somebody had learned a trick or two in the matter of wheel preservation that would be worth the while of the rest of the community to look into.

A point that must be borne in mind in this connection is that to study the conditions of one road and apply the remedies effective there on another may be of no avail. In one case, for example, flat wheels may be due to excessive brake pressures, while on another it may be due to a lavish use of sand, or an improperly hung brake beam. So, while suggestions from our neighbors are always in order, each must be a law and an investigating committee unto himself.

To show how far-reaching this individuality extends, take a month's record of cast wheel removals on maximum traction tracks. There were 379 removals of the large wheels and 209 of the small. Of these, 139 large wheels were removed for chipped flanges and 97 of the small. In this it appears that, though the speed of rotation of the small wheel was 1.65 times as fast as that of the large one, the wear was only about 0.46 as much, as evidenced by the comparative number of worn-out wheels removed, which was 240 of the large and 112 of the small. This is probably due to the fact that the weight on the small wheel was but 0.47 per cent of the weight on the large one. There is a remarkable coincidence in these figures which may be nothing more than a coincidence as far as available data is concerned, but it does seem to show that there is something in the stresses to which the wheels are subjected that has a direct and immediate effect upon their life, though the slipping of the large wheel under the influence of the motor is undoubtedly an important factor in this relative difference of wear.

The same statement regarding the effects of weight holds in the matter of chipped flanges. Those of the small wheels were but 70 per cent as many as those of the large. The difference here must have been due to the difference in the weights carried and the force of the blow delivered, for the motor is rarely working when the wheels strike the crossings of special work and the conditions of operation of the large and small wheels was practically the same. It is hardly to be expected that that Utopian condition will ever be reached when 100 per cent of all wheels removed will be because they have been worn out in legitimate service and have received no unfair treatment; but it is safe to say that a much nearer approach to this can be attained on the majority of roads than they now enjoy if they will but institute an investigation as to the real causes of their present wheel troubles. It may, perhaps, be added as a profitable suggestion that the investigation should be made by a disinterested party

and one who will not feel that it devolves upon him to put the responsibility upon the track, trucks, wheels or cars according to the personal interests of himself or his friends. That this is too often done is a lamentable fact, and only serves to establish the truth of the old statement that anything can be proven by statistics.

NEW CARS FOR INTERURBAN TRAVEL OUT OF PITTSBURG

One of the most interesting of the many interurban lines running out of Pittsburg is the Pittsburg, McKeesport & Greensburg Railway, the scenic line between Trafford City, Irwin, Jeannette, Greensburg, Mount Pleasant, Scottdale, Connellsville and Uniontown. All cars connect at Trafford City with the Pittsburg Railways for points in greater Pittsburg and surrounding towns, and all points south on the West Penn system. All the towns mentioned, as well as

CHILDREN'S PLAYGROUND IN OAKFORD PARK

ONE OF THE BIG PITTSBURG, McKEESPORT & GREENSBURG CARS ENTERING OAKFORD PARK

many others along the route, have seen an almost unprecedented growth since this territory was electrified. A large portion of the traffic handled consists of employees of the various coke companies whose ovens are thickly scattered throughout the entire distance, and at night the illuminations from these ovens with their snake-like formation present an exceedingly grotesque and novel appearance. The scenic features met with are extensively advertised by the company, the mountains forming a very pleasing background to the landscape. The grades encountered in this mountainous region are exceedingly heavy and the system of braking employed on the cars is very complete. The gage of the track is 5 ft. 2 ins. and is composed of girder rails of 75 to 95 lbs., and 70-lb. T-rails laid on oak and chestnut ties with 24-in. centers. Many railways claim for the pleasure parks they own scenic beauties and attractions surpassing those of any other, but in advertising Oakford Park, midway between Greensburg and Jeannette, as the most popular pleasure park between Harrisburg and Pittsburg, the management is well justified. The park is also one of the largest, and it is the sense of freedom and invigoration which fairly breathes in the photographs accompanying this article which has made Oakford Park the healthful and natural playground that it is. The receipts of the company average about $875 per day and the business is conducted on about 40 per cent of gross; last year the net surplus which showed over operating expense and interest charge, amounted to $32,250, and this year the net surplus

A LINE OF CARS ENTERING OAKFORD PARK

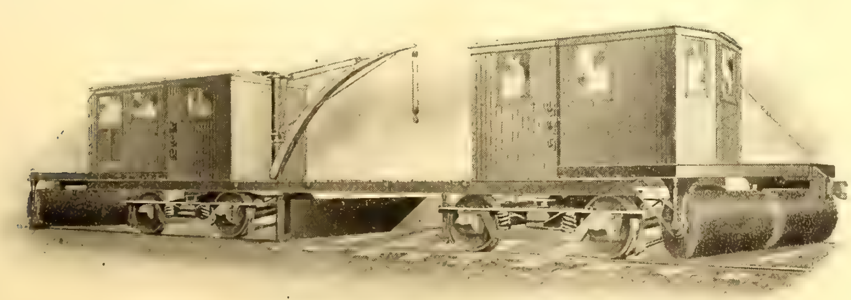
over operating expenses and interest will approximate $75,000.

The car shown in the illustration as just leaving the park is one of five cars which have lately been put on the lines; they were built by the G. C. Kuhlman Car Company, of Cleveland. It measures 44 ft. 4 ins. over the vestibule sheathing, the length over end panels being 33 ft. 4 ins.; width over the sills, including the plates, is 8 ft. 7½ ins. and over the posts at the belt 8 ft. 9 ins.; height from the floor to the ceiling 8 ft. 4⅜ ins. and from the track to the under side of the sills 2 ft. 9⅛ ins.; height from the under side of the sills over the trolley board 9 ft. 3½ ins. and from the track to the platform step 1 ft. 4½ ins.; size of the side sills 4 ins. x 7¾ ins.; the end sills measure 5¼ ins. x 6⅞ ins. The bright interiors, large windows, wide seats and commodious aisles are the result of using a car having the grooveless post semi-convertible feature. A heater is placed at one end of the car and the continuous basket racks fitted with coat hangers are comforts not always provided by railway managements. The trucks are of the M. C. B. type, No. 23-A, built by the American Car Company; the wheel base is 6 ft. Four motors of 55-hp capacity each were installed to enable the cars to overcome the severe grades and maintain the very fast schedule provided.

A COMBINATION SNOW-SWEEPER, DERRICK AND WORK CAR

The accompanying illustration shows the latest type of combination double-truck, steel-frame snow-sweeper, derrick, work car and locomotive which has just been put on the market by the McGuire-Cummings Manufacturing Company, of Chicago. This car combines a number of advantages that will be most appreciated by managers of city and interurban lines.

The trucks are of the M-C-B locomotive type, with 33-in. wheels, 4¼-in. journals, and are built to carry motors of the heaviest type. The main steel frame is built of angles and channels, thoroughly braced and riveted in the most approved manner, so as to prevent buckling of the frames. The broom extension arms, which carry all the cleaning apparatus, are constructed of 8-in. channels, and are thoroughly braced, the outer end being supported by a truss, as shown in cut. These broom frames can be removed from the car by releasing a few bolts, thus leaving the main car ready for work on construction purposes during the summer months. Two cabs—one at each end of the car—hold the



COMBINED WORK CAR AND SNOW-PLOW

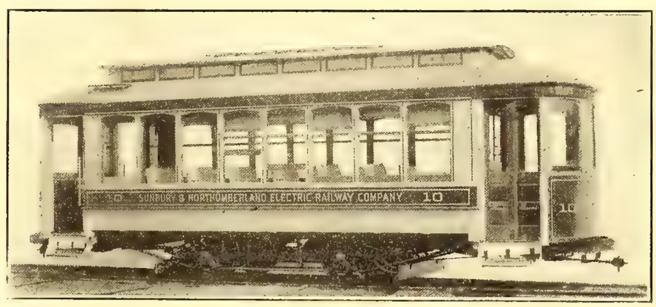
broom driving motors, also the rope drums, etc., for operating the derrick.

The derrick is of 5 tons capacity, with a 12-ft. boom, and will operate through an arc of 180 degs. The derrick is so arranged that it can be operated either by hand or by electric power. Large wrought steel hoops are placed on each side of both cabs for the carrying of poles, rails and other material. Stake pockets are provided between the two cabs, so that sideboards can be used for carrying ballast, etc.

The great advantage in a car of this class is that the operating manager has no idle capital tied up during the summer season, such as is at present represented by the purchase of sweepers with fixed brooms, and therefore this car will prove to be one of the best investments that an operating manager can make for his line. The builder of this machine has already booked a number of orders for same. A machine of this class, for the West Pennsylvania Company, will be on exhibit at the Columbus Convention in October.

NEW CARS FOR THE SUNBURY & NORTHUMBERLAND ELECTRIC RAILWAY

That a short line if properly managed can show excellent returns in comparison to roads of much greater length is exemplified in the Sunbury & Northumberland Electric Rail-



SINGLE-TRUCK CAR FOR THE SUNBURY & NORTHUMBERLAND ELECTRIC RAILWAY

INTERIOR OF SUNBURY & NORTHUMBERLAND CAR, SHOWING SEATING ARRANGEMENT

way, which has just added to its lines a number of semi-convertible grooveless post cars to take care of increasing travel. The termini at Market Square in Sunbury and Sixth Street in Northumberland are only 3 miles apart, but between these points traffic at times is exceedingly heavy, and during the month of July of this year 100,000 passengers were carried, an excellent showing in view of the length of the line and the number of cars operated, the latter numbering eleven.

Island Park, which lies midway between the termini and situated on Packer's Island, is the destination of a majority of the passengers, and the coming season the company expects to make substantial improvements to this resort and will erect a larger theater, build a scenic railway and create other amuse-

ments likely to make Island Park more popular than ever. The lines in Sunbury are now being extended to Bainbridge, one mile distant, Bainbridge being only 3 miles from York Haven, and good returns are looked for when this hitherto unemployed territory is electrified. In the spring it is the company's intention to add 2 more miles to the circuit in Sunbury. Four different roads are expected to make connection with Sunbury within the next two years, and everything points to the town becoming an important street railway center in the very near future.

A car mounted on a single truck and containing the Brill semi-convertible feature makes an exceedingly neat and attractive conveyance, and the general manager of the road, C. J. Callahan, is very well satisfied with the results already obtained from this type, which is new with this railway. The No. 21-E truck on which these cars are mounted has the advantage of carrying the car body 2 ins. lower than any other single truck; the wheel base is 7 ft. 6 ins. and the cars have 40-hp motors. The length over the end panels is 21 ft. 4 ins., and over the vestibules 30 ft. 4 ins.; width over the sills, 7 ft. 10½ ins., and over the posts at the belt, 8 ft. 2 ins.; height from the rail over the trolley board, 11 ft. 9¼ ins.; size of the side sills, 5 ins. x 8 ins.; end sills measure 4½ ins. x 8 ins.; length of the seats, 36 ins.; width of the aisle, 22 ins. Sand boxes, alarm and signal bells, angle-iron bumpers and radial draw-bars are all of the car builder's manufacture, as well as the system of vestibule door control.

VITRIFIED BRICK FOR PAVING

As in other engineering matters, the proper selection of a paving material hinges on many other factors besides that of first cost. The day of the cobblestone is past despite its cheapness, but among the purveyors and users of modern paving materials it is still a matter of dispute as to which of them is the best from the additional standpoints of maintenance, cleanliness and noiselessness. The opponents of asphalt point out its special unsuitability for streets with heavy traffic, owing to the apparent ease with which holes are formed in it (wheel marks being plainly visible when asphalt has softened under heat), with the attendant annoyance and expense of frequent repairs. Granite blocks are too noisy and not as close fitting as up-to-date communities demand, so that the choice would appear to lie between treated wood blocks and vitrified bricks. The characteristics of the former have already been referred to in this journal, so that only those of the latter need be mentioned here.

A type of vitrified brick embodying many good points is that made by the Mack Manufacturing Company, of Philadelphia. It is made of a clay composed of 71.73 per cent silica, 20.43 per cent alumina, 0.67 per cent oxide of iron, 0.46 per cent calcium sulfate, 0.87 per cent alkalies and undetermined, and 5.84 per cent water of hydration. This composition was declared by an eminent chemist to be the best for the manufacture of paving bricks and sewer pipe. The bricks are burned at a very high heat, which causes the iron, lime, magnesia and potash to combine chemically with the silica and alumina, forming a tough vitrified brick impervious to chemical changes in service.

A point that must appeal with special force to street railways is the facility with which pavement of this brick can be taken up and replaced whenever the track must be disturbed for repairs or bonding. Good brick paving once laid requires little attention, and such repairs as may be needed can be carried out without the use of road rollers and street furnaces.

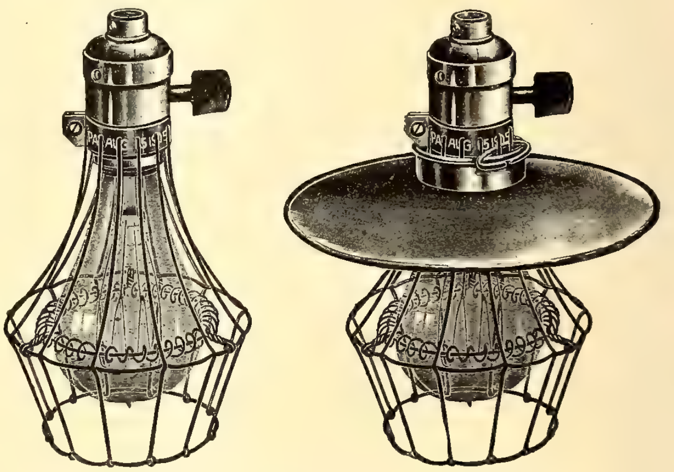
Combining toughness with vitrifaction, this brick is able to withstand with no perceptible wear the striking of horses' shoes and the impact of rolling loads. The irregularities of the surface in granite blocks causes great wear by a loaded wheel rising and falling in its passage over it. As vitrified brick forms a regular surface, this condition is absent, and in ability to stand heavy traffic this brick is second only to granite.

Owing to its great density, this brick does not absorb outside liquid impurities or retain any on its smooth surface. Slipperiness is also absent from this material, as the many joints in a brick pavement afford an excellent foothold for horses. Dust is a particularly unpleasant thing for the equipment under a car, but it may be reduced to the minimum by using this brick, which is too hard to disintegrate into powder and too smooth to retain large amounts of street litter. Noiselessness is another feature demanded of modern paving material. This also is satisfied by vitrified brick, which reduces the noise from traffic as effectually as asphalt.

AN EFFECTIVE LAMP GUARD

The illustrations shown herewith give a good idea of the construction and advantages of the Hold Fast Lamp Guard, made by the Hold Fast Lamp Guard Company, of St. Louis. The scientific manner in which this device is constructed, the absolute protection it gives to the lamp against breakage, and the fact that it never allows the lamp to come any closer than one inch to inflammable objects, should give it a wide sale wherever a good lamp guard is needed.

Fig. 1 shows the guard on a socket with the lamp inside. The large air space secured, which prevents any chance of



FIGS. 1 AND 2.—TWO TYPES OF GUARDED LAMPS

fire, has been endorsed by many fire insurance men who have seen this guard. For bench work it has two special advantages. It will stand on end like an oil lamp, and the downward rays of light are not obstructed. Another great advantage is that it acts as a shade holder, as shown in Fig. 2. Any standard size shade will fit over it. This is a great convenience and saving. The opening at the bottom permits its removal or replacing with ease.

The center spreading ring meets with all the impact upon the guard. Its rigid construction and outward extension form a positive point for impact that prevents any distortion or dislocation of any part of the guard when subject to severe usage. The spiral cushion counteracts the effect of any jar or vibration of the lamp caused by impact upon the guard, and assures safety to the lamp under all circumstances.

The manufacturers of this guard have a test that they recommend for trying its efficiency and which they claim no

other guard will stand. It consists of rigging up a drop-cord, 6 ft. to 10 ft. long and about 2 ft. or 3 ft. from a solid wall (brick or stone preferred). Attach the guard to the socket, put in the lamp and dash the guard and lamp against the wall with force. Despite this test the lamp will remain intact.

HIGH-GRADE INSULATION FOR DELTABESTON COILS

Although Deltabeston magnet wire is used by a great many manufacturers of armature and field coils, their finished product is by no means uniform. Aside from the degree of care in making up the coils, the greatest variations in service are due to the different kinds of covering, and insulating materials used. For example, some are tempted on the score of cheapness to use the poorer cotton or linen coverings which are incapable of standing high temperatures without charring, instead of employing the more expensive but far superior asbestos tapes.

When the F. P. Harrison Electric & Manufacturing Company, of New York, built a special plant to undertake the manufacture of Deltabeston armature and field coils, it felt that the severe conditions of railway service demanded nothing but the best. In line with this idea, the company covers all of its coils with a high-grade insulation capable of withstanding temperatures as high as 550 deg. F. In fact, coils covered with this insulation can be put in a blow-torch flame with impunity. The methods specified by the D. & W. Fuse Company, the manufacturers of Deltabeston wire, are followed so faithfully that the guarantees of the said company will be applied to all work of this character done by the Harrison Company.

After the coils have been wound and taped, they are placed in a specially built oven where they are thoroughly dried out by being subjected to a temperature of 450 deg. F. The coils are then taken out, dipped in a special insulating compound and placed in another oven and baked to 360 deg. F. They are redried and rebaked several times after being impregnated with a secret composition to fill up all possible air gaps. After the fifth immersion in this special insulating compound, copper water shields are then put on the terminals of the field coils and micanite placed over them. The coils are again baked in another special compound for the sixth and last time, after which they are water-proofed and thus completed for service. All the coils manufactured by this company are guaranteed for one year from damage by heat or moisture. Every coil manufactured is tested and thoroughly inspected before being shipped to the consumer.

A. E. Meixwell, vice-president and general manager of the company, who has had an experience ranging from the railway pit to the higher office of manager of several railways, gives his personal attention to the output of Deltabeston products. In addition to making new coils, the company does all kinds of repair work and is also sales agent for Kalamazoo wheels, railway specialties and Electros insulation. It does a general railway supply business, and carries almost everything that is used by an electric railway. The company announces that it will have a complete exhibit at Columbus.

ATLANTIC CITY & SHORE RAILROAD COMPANY

The Atlantic City & Shore Railroad Company is a new road which has been put in operation at Atlantic City, N. J.

The company owns the Central Passenger Railway in Atlantic City, which operates a short loop in Atlantic City between South Carolina Avenue, Virginia Avenue and the Boardwalk. This line operates in the summer five single-truck double motor cars with power supplied by the West Jersey & Seashore Company.

The Atlantic City & Shore Railroad has a steam-road franchise, and extends from a junction with the Central Passenger Railway at Adriatic and Virginia Avenues, on a private right of way through the northwestern section of Atlantic City, crosses the tracks of the Pennsylvania and the Reading Railroads, then extends via the West Jersey & Seashore third-rail Newfield Branch as far as Pleasantville. From Pleasantville to Somers Point the company operates by lease over the old Somers Point Branch. A line is also building across Great Egg Harbor to Ocean City. From the junction at Adriatic and Virginia avenues to the drawbridge, overhead center-pole suspension is used. From the drawbridge to Pleasantville third rail, and from Pleasantville to Somers Point overhead catenary suspension is used.

The equipment consists on the Shore Line of twenty 36-ft vestibule Brill semi-convertible cars, Brill trucks, M. C. B. wheels; four GE-87 60-hp motors under each car, G. E. multiple-unit system, using trolley and third-rail shoe. The line was opened up to Somers Point on Aug. 25, 1906. The run from Boardwalk and Virginia Avenue to Somers Point, including stops, is being made in thirty-five minutes. A large amusement park is contemplated at Somers Point. The company has its own sub-station at Somers Point, but gets current from the West Jersey & Seashore power station at Westville, N. J. The president of the road is W. A. Stern, of the firm of Stern & Silverman. The other officers are Chas. Evans, vice-president; A. H. Melton, secretary; M. J. Greenbaum, treasurer; S. S. Neff, Atlantic City, superintendent.

OPERATING STATISTICS FOR ROADS IN NEW YORK STATE

For several years H. M. Beardsley, secretary and treasurer of the Elmira Water, Light & Railroad Company, has compiled for the Street Railway Association of the State of New York a set of tables showing the detailed expenses and receipts per car-mile for the different members in the association with the exception of the companies in New York City. The bases of these figures are the reports filed by the different companies with the Board of Railroad Commissioners. The figures for the year ending June 30, 1905, were published in the STREET RAILWAY JOURNAL for July 15, 1905. Mr Beardsley's figures for the year ending June 30, 1906, are presented herewith.

LARGE GENERATORS FOR THE MONTREAL LIGHT, HEAT & POWER COMPANY

The Montreal Light, Heat & Power Company has recently contracted with the Canadian Westinghouse Company, Ltd., for a large addition to its power equipment. The apparatus contracted for is for the company's new Soulanges Canal power station on the St. Lawrence River. The equipment consists of three Westinghouse 3750-kw revolving field, alternating current, two-bearing generators connected to water turbines. These generators are 7200 alternations, 4000 volts, three-phase, operating at 225 r. p. m. There are also two 150-kw, direct-current 125-volt exciter units. Oil-insulated, water-cooled transformers of 2500 kw and to the number of thirteen are also an important part of the equipment. Seven of these transformers will be used for raising the voltage at their generating station from 4000 to 44,000 volts, and six of them will be used at the lowering end of the transmission line, stepping down the voltage from 44,000 to 12,000. This contract is among the largest recently placed in the Canadian field.

Income and Operating Expenses Per Car Mile of Roads Which Are Members of the New York State Association. (Except New York City.)

Year Ending June 30, 1905.

Compiled by H. M. BEARDSLEY, Elmira, N. Y.

City	ALBANY		ALBANY		AUBURN	
Company	Albany & Hudson		United Traction Co.		Auburn & Syracuse Co.	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	704,050		7,672,842		1,068,830	
Income From Operation	$200,671 65	28.50	$1,714,848 82	22.35	$268,507 78	25.12
1. Maintenance track and roadway	11,512 87	1.63	63,246 60	.82	18,190 65	1.70
2. " electric line	1,684 01	.24	16,129 02	.21	7,600 41	.71
3. " buildings	1,075 21	.15	6,707 61	.09	513 17	.05
4. " steam plant	2,536 08	.36	3,244 17	.04	1,800 13	.17
5. " electric plant	238 78	.03	1,379 64	.02	230 19	.02
6. " cars	9,899 23	1.42	31,990 72	.42	7,244 89	.68
7. " electrical equipment of cars	6,967 13	.99	27,672 96	.36	4,496 90	.42
8. " miscellaneous equipment	481 90	.06	2,460 37	.03	344 46	.03
9. Miscellaneous shop expenses	881 66	.12	5,083 19	.06	704 57	.07
Total Maintenance	35,276 87	5.01	157,914 28	2.05	41,125 37	3.85
10. Power plant wages	7,902 82	1.12	11,804 26	.15	14,516 47	1.37
11. Fuel	21,358 34	3.04	4,518 42	.06	17,226 02	1.61
12. Water			Cr. 1,515 87	.02	250 50	.02
13. Oil and waste	1,442 64	.21	557 00	.01	726 81	.07
14. Miscellaneous expenses of power plant	222 71	.03	1,109 14	.01	Cr. 7 64	
15. Hired power			150,900 75	1.97		
16. Supt. of transportation	4,882 21	.69	47,942 24	.63	908 32	.09
17. Wages of conductors	13,222 09	1.87	201,284 58	2.62	17,569 13	1.64
18. Wages of motormen	14,580 10	2.07	200,853 44	2.62	17,569 22	1.64
19. Wages other car service employees	11,484 18	1.63	22,393 05	.29	231 25	.02
20. Wages car house employees	4,655 88	.66	24,086 78	.31	8,987 66	.84
21. Car service supplies	1,179 21	.17	4,748 37	.06	1,220 33	.11
22. Miscellaneous car service expenses	5,682 90	.81	19,163 59	.25	2,118 65	.20
22a. Hired equipment or express			32,299 13	.42	-	
23. Cleaning and sanding track			21,576 65	.28	243 62	.02
24. Removal of snow and ice	1,632 25	.23	5,868 70	.08	1,382 75	.13
Total Operating	88,245 33	12.53	747,590 29	9.74	83,003 09	7.76
25. Salaries of general officers	4,453 75	.63	19,076 73	.25	1,648 39	.15
26. Salaries of clerks	3,594 16	.51	19,117 13	.25	3,680 07	.35
27. Printing and stationery	1,097 30	.17	4,200 40	.05	378 32	.03
28. Miscellaneous expenses	369 80	.05	6,686 21	.08	1,996 25	.19
29. Store room expenses	519 88	.07	2,243 10	.03	10 50	
30. Stable expenses			7,242 27	.09	859 97	.08
31. Advertising and attractions	7,269 48	1.03	737 94	.01	3,524 57	.33
32. Miscellaneous general expenses	2,434 92	.35	7,887 57	.12	2,366 38	.22
33. Damages	1,292 09	.18	40,611 82	.53	8,026 82	.75
34. Legal expenses in connection with damages	836 03	.12	11,665 88	.15		
35. Other legal expenses			5,746 53	.07	250 00	.02
36. Rent of land and building	371 88	.05	1,181 49	.01	742 50	.07
37. Rent of track and terminals	4,600 00	.65	43,283 73	.57	12,055 68	1.13
38. Insurance	2,400 00	.34	18,526 52	.24	26,19 80	.25
39. Express						
Total General	29,239 29	4.15	188,207 32	2.45	38,167 25	3.57
Total Operating Expenses	152,761 49	21.69	1,093,711 89	14.24	162,295 71	15.18
Taxes	18,400 00	2.61	84,892 00	1.11	11,375 60	1.06
Total Expenses and Taxes		24.30		15.35		16.24

City	BINGHAMTON		BUFFALO		CANANDAIGUA	
Company	Binghamton Ry. Co.		International Tr. Co.		Rochester & Eastern	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	1,285,067		14,682,630		762,586	
Income From Operation	$258,819 85	20.14	$3,694,339 01	25.16	$212,668 51	27.88
1. Maintenance track and roadway	5,137 76	.40	130,646 98	.89	10,631 94	1.39
2. " electric line	1,712 56	.13	23,299 63	.16	2,427 54	.32
3. " buildings	465 18	.04	10,720 44	.07	300 84	.04
4. " steam plant	1,541 35	.12	7,126 30	.05	668 24	.09
5. " electric plant	117 78	.01	13,882 59	.09	186 93	.02
6. " cars	6,951 46	.54	103,736 01	.70	9,385 39	1.23
7. " electrical equipment of cars	9,317 83	.72	74,760 70	.51	3,239 99	.42
8. " miscellaneous equipment	511 96	.04	5,201 99	.04	573 48	.08
9. Miscellaneous shop expenses	1,161 91	.09	9,643 91	.06	1,614 97	.21
Total Maintenance	26,917 79	2.09	379,018 55	2.57	29,029 32	3.80
10. Power plant wages	6,306 30	.49	31,864 35	.22	9,086 20	1.19
11. Fuel	15,799 64	1.23	23,626 22	.16	23,175 21	3.04
12. Water			1,467 23	.01	182 88	.02
13. Oil and waste	819 92	.06	2,352 74	.02	1,009 00	.13
14. Miscellaneous expenses of power plant	275 37	.02	2,458 70	.02	431 42	.06
15. Hired power			217,829 70	1.48		
16. Supt. of transportation	1,271 26	.10	33,583 97	.23	2,328 60	.31
17. Wages of conductors	27,349 62	2.13	347,830 85	2.37	10,943 04	1.40
18. Wages of motormen	28,475 90	2.22	341,515 95	2.32	10,568 61	1.39
19. Wages other car service employees	2,124 04	.16	59,607 34	.41	5,928 40	78
20. Wages car house employees	4,032 42	.31	71,745 30	.49	3,915 95	.52
21. Car service supplies	958 76	.07	14,444 97	.10	1,410 44	.20
22. Miscellaneous car service expenses	174 76	02	39,619 55	.27	5,466 02	72
22a. Hired equipment or express			722 89			
23. Cleaning and sanding track	633 24	.05	11,584 26	.08	171 38	.02
24. Removal of snow and ice	701 35	.06	32,399 84	.22	1,664 92	.22
Total Operating	88,922 58	6.92	1,232,653 86	8.40	76,282 07	10.00
25. Salaries of general officers	4,500 00	.35	41,047 89	.28	3,233 85	.42
26. Salaries of clerks	2,130 87	16	23,612 08	.16	4,239 79	.56
27. Printing and stationery	410 91	.03	4,652 60	.03	1,702 41	.23
28. Miscellaneous expenses	350 91	.03	5,202 83	.04	377 09	.05
29. Store room expenses			7,959 26	.05	488 47	.06
30. Stable expenses	671 43	.05	5,143 60	.04		
31. Advertising and attractions	7,345 06	.57	6,421 97	.04	2,011 53	.26
32. Miscellaneous general expenses	1,541 39	.12	21,615 92	.15	1,438 20	.19
33. Damages	1,464 63	.12	203,024 69	1.38	22,370 57	2.93
34. Legal expenses in connection with damages	56 27		10,132 99	.07	1,174 31	.15
35. Other legal expenses	150 00	.01	16,321 46	.11	170 84	.02
36. Rent of land and building			12,606 62	.08	1,635 02	.22
37. Rent of track and terminals			600 00		11,270 97	1.48
38. Insurance	2,400 00	.19	43,562 44	.30		
39. Express						
Total General	21,021 47	1.63	401,904 35	2.73	50,113 05	6.57
Total Operating Expenses	136,861 84	10.64	2,012,576 76	13.70	155,424 44	20.37
Taxes	7,500 00	.59	175,990 10	1.20	7,565 85	.99
Total Expenses and Taxes		11.23		14.90		21.36

City	CORTLAND		ELMIRA		FISHKILL	
Company	Cortland Co. Traction		E. W., L. & R. R. Co.		Cit. Ry., L. & P. Co.	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	214,125		1,212,066		171,574	
Income From Operation	$49,139 86	22.95	$192,921 47	16.06	$41,474 56	24.17
1. Maintenance track and roadway	4,608 39	2.15	11,387 42	.94	3,320 90	1.94
2. " electric line	651 68	.31	2,814 38	.23	216 81	.12
3. " buildings	36 76	.01	468 35	.04	202 99	.12
4. " steam plant	169 48	.08				
5. " electric plant	128 82	.06				
6. " cars	1,531 54	.72	7,083 63	.58	1,755 79	1.02
7. " electrical equipment of cars	907 92	.43	5,837 00	.48	1,886 51	1.10
8. " miscellaneous equipment	36 59	.01	24 10		236 68	.13
9. Miscellaneous shop expenses	185 31	.08	140 77	.02		
Total Maintenance	8,256 49	3.85	27,755 65	2.29	7,619 68	4.43
10. Power plant wages	1,566 41	.73				
11. Fuel	4,654 60	2.17				
12. Water						
13. Oil and waste	156 12	.07				
14. Miscellaneous expenses of power plant	87 91	.04				
15. Hired power			26,673 99	2.20	5,796 00	3.38
16. Supt. of transportation	1,070 00	.50	1,468 60	.12		
17. Wages of conductors	4,506 63	2.11	25,188 41	2.08	3,733 52	2.18
18. Wages of motormen	4,223 62	1.98	24,348 43	2.01	4,478 60	2.61
19. Wages other car service employees	360 00	.17	1,174 70	.10		
20. Wages car house employees	713 12	.33	3,633 50	.30	643 75	.37
21. Car service supplies	152 59	.07	1,159 10	.09	482 03	.28
22. Miscellaneous car service expenses	571 59	.26	2,042 31	.17		
22a. Hired equipment or express						
23. Cleaning and sanding track	96 80	.04	1,356 15	.11	149 63	.09
24. Removal of snow and ice	311 78	.14	868 73	.07	536 83	.31
Total Operating	18,471 47	8.61	87,913 92	7.25	15,820 36	9.22
25. Salaries of general officers	1,535 00	72	3,367 50	.28	1,918 00	1.12
26. Salaries of clerks	914 50	.43	1,178 31	.10		
27. Printing and stationery	85 04	.04	51 25		21 50	.01
28. Miscellaneous expenses	384 00	18	727 49	.06	278 53	.17
29. Store room expenses						
30. Stable expenses	304 75	.14				
31. Advertising and attractions	616 84	.28	1,150 12	.09	124 57	.07
32. Miscellaneous general expenses	542 71	.25	1,197 59	.10	34 90	.02
33. Damages	183 47	.09	3,892 39	.32	42 06	.02
34. Legal expenses in connection with damages						
35. Other legal expenses			875 00	.07	27 50	.01
36. Rent of land and building			855 10	.07		
37. Rent of track and terminals			363 28	.03		
38. Insurance	1,235 44	.58	1,488 66	.12	890 45	.52
39. Express						
Total General	5,801 75	2.71	15,146 74	1.24	3,337 51	1.94
Total Operating Expenses	32,529 71	15.17	130,816 31	10.78	26,774 55	15.59
Taxes	1,899 34	.89	10,015 45	.83	1,290 00	.75
Total Expenses and Taxes		16.06		11.61		16.34

Income and Operating Expenses Per Car Mile of Roads Which Are Members of the New York State Association. (Except New York City.)

Year Ending June 30, 1905.

Compiled by H. M. BEARDSLEY, Elmira.

City	FREDONIA		GLENS FALLS		HORNELLSVILLE		ITHACA	
Company	Dunkirk & Fredonia		Hudson Valley Ry. Co.		Hornell Elec. Ry.		Ithaca St. Ry. Co.	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	165,163		1,927,473		181,870		386,026	
Income From Operation	$44,457 88	26.92	$499,148 09	25.89	$16,919 70	9.30	$91,817 90	23.21
1. Maintenance track and roadway	3,527 74	2.14	30,723 50	1.59	767 23	.42	1,519 93	.38
2. " electric line	488 78	.30	7,946 25	.41	46 57	.02	662 27	.17
3. " buildings	757 11	.46	1,375 63	.07	579 26	.32	799 78	.20
4. " steam plant	2,025 07	1.23	3,998 75	.21			6 56	
5. " electric plant	217 60	.13	3,036 45	.16				
6. " cars	2,453 56	1.48	8,866 22	.46	1,370 40	.75	2,652 88	.68
7. " electrical equipment of cars	1,633 99	.99	15,978 38	.83	1,344 86	.75	2,357 08	.60
8. " miscellaneous equipment	57 71	.03	906 54	.05			14 37	
9. Miscellaneous shop expenses			2,669 12	.14			659 74	.17
Total Maintenance	11,161 56	6.76	75,500 84	3.92	4,108 32	2.26	8,672 61	2.20
10. Power plant wages	1,840 58	1.11	14,321 44	.74			4,920 89	1.27
11. Fuel	6,953 17	4.22	5,388 47	.28			17,010 36	4.41
12. Water	120 00	.07	98 05					
13. Oil and waste	303 36	.18	631 39	.04				
14. Miscellaneous expenses of power plant	150 00	.09	1,193 62	.06			65 00	.02
15. Hired power	1,030 00	.62	29,949 86	1.56	3,370 09	1.85		
16. Supt. of transportation			9,208 47	.48				
17. Wages of conductors	5,228 87	3.17	33,211 54	1.72	3,241 57	1.78	9,564 82	2.47
18. Wages of motormen			33,496 26	1.73	3,230 30	1.78	9,341 29	2.42
19. Wages other car service employees			4,145 68	.22			885 14	.23
20. Wages car house employees			7,019 53	.36	362 13	.20	1,145 78	.30
21. Car service supplies			2,923 45	.16			516 26	.13
22. Miscellaneous car service expenses	594 71	.36	7,443 44	.38			93 75	.02
22a. Hired equipment or express			27,140 16	1.41				
23. Cleaning and sanding track	15 10	.01	9[illegible] 52	.05			828 11	.22
24. Removal of snow and ice	1,202 13	.73	5,630 22	.29	74 59	.04	194 60	.05
Total Operating	17,437 92	10.56	182,779 10	9.48	10,278 68	5.65	44,566 00	11.54
25. Salaries of general officers	650 00	.39	10,191 42	.53	732 90	.42	2,683 87	.70
26. Salaries of clerks	656 43	.40	8,384 10	.43				
27. Printing and stationery			832 70	.04			167 85	.04
28. Miscellaneous expenses	179 77	.11	1,234 02	.06	9 58		381 85	.10
29. Store room expenses			873 99	.05				
30. Stable expenses			739 30	.04			40 31	.01
31. Advertising and attractions	3,188 55	1.93	485 42	.03			4,223 01	1.09
32. Miscellaneous general expenses	438 97	.27	2,640 29	.14	352 73	.19	1,027 07	.26
33. Damages	400 00	.24	20,444 32	1.06	55 50	.03		
34. Legal expenses in connection with damages			1,961 97	.10	6 25		4,200 00	1.09
35. Other legal expenses			3,293 97	.17				
36. Rent of land and building	300 00	.18	2,650 47	.14				
37. Rent of track and terminals			16,026 35	.83				
38. Insurance	566 19	.34	6,600 00	.34	155 49	.08	925 54	.24
39. Express								
Total General	6,379 91	3.86	76,358 32	3.96	1,312 45	.72	13,649 50	3.53
Total Operating Expenses	34,979 39	21.18	334,638 26	17.36	15,699 45	8.63	66,888 11	17.27
Taxes	2,297 78	1.39	14,877 10	.77	779 80	.43	2,308 74	.60
Total Expenses and Taxes		22.57		18.13		9.06		17.87

City	KINGSTON		NEWBURGH		OGDENSBURG.		ONEIDA		ONEONTA	
Company	King. Consol. R. R. Co.		Orange Co. Trac. Co.		Ogdensburg St. Ry. Co.		Oneida Railway Co.		O. C. & R. S. Ry. Co.	
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	535,527		595,099		278,460		146,674		650,308	
Income From Operation	$123,632 92	23.08	$119,270 85	20.04	$27,240 09	9.78	$13,528 65	9.22	$103,862 05	15.97
1. Maintenance track and roadway	4,305 70	.81	4,943 07	.83	650 53	.23	11 35	.01	6,390 59	.98
2. " electric line	883 69	.16	1,615 97	.27	193 96	.07	44 11	.03	1,076 30	.17
3. " buildings	380 99	.07	577 47	.10	295 28	.11	2 25		1,199 40	.18
4. " steam plant	394 56	.07	72 28	.01					611 85	.10
5. " electric plant	13 40		1,070 00	.18			44 82	.03	2,902 26	.45
6. " cars	6,003 49	1.12	4,123 16	.69	3,235 73	1.16	393 34	.27	5,378 98	.82
7. " electrical equipment of cars	3,824 49	.72	4,601 83	.77			368 48	.25	6,527 73	1.00
8. " miscellaneous equipment	195 33	.03	327 15	.06			13 47	.01	628 88	.10
9. Miscellaneous shop expenses	1,991 91	.37	328 80	.06			810 67	.55	457 71	.07
Total Maintenance	17,993 56	3.35	17,659 73	2.97	4,375 50	1.57	1,688 49	1.15	25,173 70	3.87
10. Power plant wages	3,537 89	.66	3,313 56	.56	1,307 50	.47			5,829 55	.90
11. Fuel	8,168 12	1.53	9,900 38	1.66	2,206 58	.79			13,230 64	2.03
12. Water			200 04	.04	223 87	.08				
13. Oil and waste	618 43	.12	246 65	.04					1,443 64	.22
14. Miscellaneous expenses of power plant	282 50	.05	375 74	.06			6 91	.01	331 31	.05
15. Hired power							3,830 38	2.61		
16. Supt. of transportation									1,972 62	.30
17. Wages of conductors	11,637 97	2.17	12,240 71	2.06	9,184 65	3.30	2,670 85	1.82	5,401 55	.83
18. Wages of motormen	13,023 64	2.43	13,567 27	2.28			2,671 25	1.82	6,254 67	.96
19. Wages other car service employees			1,924 96	.32	29 80	.01	435 57	.30	2,217 64	.34
20. Wages car house employees	2,032 53	.38	1,992 91	.34			177 71	.12	1,950 60	.30
21. Car service supplies	378 29	.07	656 67	.11			86 15	.06	1,616 54	.25
22. Miscellaneous car service expenses	451 60	.08	1,270 18	.21			97 12	.07	946 74	.15
22a. Hired equipment or express										
23. Cleaning and sanding track	1,013 48	.19	488 11	.08			4 50		4 50	
24. Removal of snow and ice	584 74	.11	1,052 11	.18	473 05	.17	163 46	.11	3,893 02	.60
Total Operating	41,729 19	7.79	47,229 29	7.94	13,425 45	4.82	10,143 90	6.92	45,093 02	6.93
25. Salaries of general officers	4,500 00	.84	4,700 04	.79	1,314 68	.47			1,937 01	.30
26. Salaries of clerks	938 50	.18	2,489 39	.42	740 00	.27	353 00	.24	2,996 50	.46
27. Printing and stationery	140 80	.03	687 00	.12	25 00	.01	28 45	.02	288 67	.04
28. Miscellaneous expenses	220 76	.04	227 49	.04	685 84	.25	140 99	.09	203 31	.03
29. Store room expenses									485 93	.07
30. Stable expenses	370 17	.07								
31. Advertising and attractions	3,700 71	.69	2,779 33	.46					277 93	.04
32. Miscellaneous general expenses	777 23	.15	2,201 54	.37			121 22	.08	1,395 21	.22
33. Damages	542 12	.10	2,843 90	.48			541 14	.37	668 85	.10
34. Legal expenses in connection with damages	645 69	.12	225 50	.04	205 00	.07				
35. Other legal expenses	194 44	.03	1,039 27	.17					359 17	.06
36. Rent of land and building			548 01	.09			200 04	.14	809 08	.13
37. Rent of track and terminals	1 00									
38. Insurance	1,630 77	.30	1,712 40	.29	234 75	.08	613 81	.42	2,782 12	.43
39. Express										
Total General	13,662 19	2.55	19,453 87	3.27	3,205 27	1.15	1,998 65	1.36	12,208 78	1.88
Total Operating Expenses	73,384 94	13.69	84,342 89	14.18	21,006 22	7.54	13,831 04	9.43	82,475 50	12.78
Taxes	4,697 96	.88	7,200 00	1.21	892 17	.32	855 29	.58	6,787 67	1.04
Total Expenses and Taxes		14.57	91,542 89	15.39	21,898 39	7.86	14,686 33	10.01	89,263 17	13.82

Income and Operating Expenses Per Car Mile of Roads Which Are Members of the New York State Association. (Except New York City.)

Year Ending June 30, 1905.

Compiled by H. M. BEARDSLEY, Elmira.

City	PEEKSKILL		PLATTSBURGH		POUGHKEEPSIE		ROCHESTER		SCHENECTADY		SYRACUSE		SYRACUSE		UTICA		TOTAL	
Company	Peekskill L. & Ry. Co.		Plattsburgh Trac. Co.		Pough. Cy. & W. Falls		Rochester Ry. Co.		Schenectady Ry. Co.		Syracuse Rap. Transit		Syracuse & Suburban		Utica & Mohawk Valley			
	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.	Amount	Per C. M.
Car Miles	306,129		128,763		482,704		6,991,775		3,286,537		4,011635		453,820		3,389,069		51,690,802	
Income From Operation	$52,766 03	17.24	$21,577 73	16.76	$102,350 35	21.20	$1,726,073 75	24.69	$699,720 65	21.29	$888,750 15	22.15	$92,103 26	20.30	$795,033 76	23.45	$12,051,645 32	23.31
1. Maintenance track and roadway	1,200 00	.39	766 93	.60	1,527 67	.32	35,132 88	.50	18,495 28	.56	27,141 20	.68	6,464 35	1.42	33,585 23	.99	435,836 69	.84
2. " electric line	180 00	.06	170 56	.13	968 05	.20	18,070 73	.26	11,381 97	.35	7,638 28	.19	815 59	.18	8,857 27	.26	117,576 39	.23
3. " buildings	144 00	.05	73 44	.06	210 43	.04	3,634 72	.05	3,884 50	.12	2,533 24	.06	207 90	.05	1,756 83	.06	38,902 78	.07
4. " steam plant	70				875 43	.18	3,076 39	.04	644 21	.02	15,170 40	38	605 30	.13	16 38		44,583 63	.09
5. " electric plant	729 00	.24			399 71	.08	373 15	.01	877 79	.03	3,910 50	.10	120 58	.03	467 26	.01	30,327 25	.06
6. " cars	1,200 00	.39	520 48	.40	4,615 03	.96	45,629 39	.65	34,025 45	1.04	25,588 66	.64	2,010 28	.44	24,681 63	.73	352,327 34	.68
7. " electrical equipment of cars	600 00	.20	335 22	.26	2,776 50	.58	42,410 74	.61	23,101 03	.70	19,193 43	.48			28,222 83	.83	288,363 53	.56
8. " miscellaneous equipment	71 51	.02			350 00	.07	2,766 23	.04	2,345 99	.07	1,423 79	.03	2,159 59	.48	2,810 47	.08	23,942 56	.04
9. Miscellaneous shop expenses					7 08		6,143 19	.09	5,704 64	.17	3,188 54	.08	1,323 43	.29	8,650 70	.26	51,351 82	.10
Total Maintenance	4,125 21	1.35	1,866 63	1.45	11,729 90	2.43	157,237 42	2.25	100,460 86	3.06	105,788 04	2.64	13,707 02	3.02	109,048 60	3.22	1,383,211 99	2.67
10. Power plant wages					3,326 95	.67	8,918 48	.13	10,855 06	.33	11,953 72	.30	1,806 30	.40	9,416 37	.28	164,455 10	.32
11. Fuel					9,589 32	1.99	19,283 15	.27			64,666 36	1.61	1,985 34	.44	60 00		268,800 44	.52
12. Water							52 74				1,856 11	.05					2,935 56	.01
13. Oil and waste					1,026 89	.22	402 73	.01	166 17		2,036 09	.05			98 15		14,037 73	.03
14. Miscellaneous expenses of power plant					1 25		140 37		2,151 90	.06	615 94	.02	80 39	.02	572 97	.02	10,538 60	.02
15. Hired power	7,617 62	2.49	1,931 43	1.50			197,722 16	2.83	74,866 34	2.27					130,494 05	3.85	852,012 37	1.65
16. Supt. of transportation	1,111 20	.36	573 57	.44			12,054 82	.17	10,558 01	.32	3,877 50	.10			3,477 50	.10	136,288 89	.26
17. Wages of conductors	6,410 63	2.09	2,030 65	1.58	8,906 47	1.85	166,282 20	2.38	69,198 31	2.10	90,443 87	2.25	7,048 11	1.55	59,255 04	1.75	1,153,588 58	2.23
18. Wages of motormen	6,441 24	2.10	2,037 86	1.58	11,098 88	2.30	181,564 80	2.60	71,597 91	2.18	95,117 88	2.37	7,258 31	1.60	59,508 18	1.76	1,162,823 61	2.25
19. Wages other car service employees			440 00	.34	5,271 87	1.09	18,537 55	.26	6,878 03	.21	6,402 12	.16			5,346 10	.16	155,817 42	.30
20. Wages car house employees	646 30	.21	469 22	.37	6,268 22	1.30	19,962 58	.28	25,305 93	.77	10,296 48	.26	4,556 56	1.00	17,390 54	.51	221,991 38	.43
21. Car service supplies	179 13	.06	192 89	.15	97 76	.02	17,325 91	.25	6,812 96	.20	5,727 08	.14	185 42	.04	6,793 25	.20	69,247 46	.13
22. Miscellaneous car service expenses	290 05	.10	260 25	.20	225 90	.05	22,830 14	.33	18,379 35	.56	5,423 28	.13	542 70	.12	6,883 24	.20	140,571 82	.27
22a. Hired equipment or express																	60,162 18	.12
23. Cleaning and sanding track	117 52	.04	51 90	.04	52 71	.01	3,676 12	.05	3,979 55	.12	4,540 48	.11	237 95	.05	2,016 32	.06	53,815 60	.10
24. Removal of snow and ice	398 44	.13	107 75	.09	1,072 25	.22	17,084 52	.25	5,036 14	.15	5,254 30	.13	572 45	.13	7,367 81	.22	95,528 73	.18
Total Operating	23 212 13	7.58	8,099 52	6.29	46,938 47	9.72	685,838 27	9.81	305,785 66	9.27	308,211 21	7.68	24,273 63	5.35	308,679 52	9.11	4,562,615 47	8.82
25. Salaries of general officers	1,500 00	.49	1.500 00	1.17	6,775 00	1.40	13,399 96	.19	4,596 02	.14	11,333 67	.28	3,560 00	.78	9,719 96	.29	159,902 64	.31
26. Salaries of clerks	703 00	.23			4,042 62	.84	11,351 45	.16	10,206 77	.31	4,350 87	.11	1,604 62	.35	6,042 05	.18	113,326 21	.22
27. Printing and stationery	66 55	.02	109 35	.08	249 68	.05	520 76	.01	1,792 56	.05	428 84	.01	48 85	.01	1,315 38	.04	19,302 17	.03
28. Miscellaneous expenses	157 47	.05	48 11	.04	296 51	.06	5,681 23	.08	1,729 38	.05	687 28	.02	1,569 12	.35	980 03	.03	30,805 85	.06
29. Store room expenses							2,465 00	.04	2,719 21	.08	526 57	.01			1,030 35	.03	19,322 26	.03
30. Stable expenses					578 48	.12	6,059 43	.09	3,352 25	.10	2,373 02	.06	194 38	.04	2,005 17	.06	29,934 53	.06
31. Advertising and attractions	689 76	.22	414 70	.32	8 75	.01	8,925 48	.13	3,859 50	.12	3,355 89	.08	1,124 71	.25	3,381 08	.09	65,616 90	.12
32. Miscellaneous general expenses	446 79	.15	458 00	.36	343 06	.07	12,438 23	.18	4,971 86	.15	8,641 26	.22	3,045 99	.67	7,100 94	.21	85,459 97	.16
33. Damages	53 00	.02	1,077 79	.84	5,114 88	1.06	49,755 97	.71	39,012 55	1.19	50,698 51	1.26	1,088 07	.24	31,797 12	.94	485,002 26	.94
34. Legal expenses in connection with damages					1,886 11	.39	4,500 00	.06			10,090 93	.25	101 75	.02	2,131 76	.06	49,819 26	.10
35. Other legal expenses							2,121 03	.03	1,540 84	.05	882 18	.02	702 42	.15	2,063 80	.06	35,737 92	.07
36. Rent of land and building	167 50	.06	125 00	.09			1,500 00	.02	1,417 15	.04	1,531 28	.04	1,070 08	.24	1,295 54	.04	29,006 76	.06
37. Rent of track and terminals									3,000 00	.09							91,201 01	.18
38. Insurance	3,723 31	1.21	195 91	.15	1,511 65	.31	8,929 33	.13	11,665 05	.36	4,800 00	.12	157 05	.04	8,898 18	.26	128,224 86	.25
39. Express											782 60	.02			25,248 49	.75	26,031 09	.05
Total General	7,507 38	2.45	3,928 86	3.05	20,806 74	4.31	127,647 87	1.83	89,863 14	2.73	100,482 90	2.50	14,267 04	3.14	103,009 85	3.04	1,368,693 87	2.64
Total Operating Expenses	34,844 72	11.38	13,895 01	10.79	79,475 11	16.46	970,723 56	13.89	496,109 66	15.06	514,482 15	12.82	52,247 69	11.51	520,737 97	15.37	7,314,521 33	14.13
Taxes	3,255 92	1.06	1,195 39	.93	11,671 46	2.42	89,126 59	1.28	31,439 46	.95	36,000 00	.90	4,868 26	1.07	25,950 34	.77	563,132 27	1.09
Total Expenses and Taxes	38,100 64	12.44	15,090 40	11.72	91,146 57	18.88	1,059,850 15	15.17	527,549 12	16.01	550,482 15	13.72	57,115 95	12 58	546,688 31	16.14	7,877,654 60	15.22

FINANCIAL INTELLIGENCE

Wall Street, Sept. 26, 1906.

The Money Market

Notwithstanding the heavy gain in cash by the New York City banks resulting largely from the importation of gold from Europe, the local money market continues to rule firm during the past week, rates for time loans extending from ninety days to six months, commanding 6 per cent and a commission, bringing the total charge to the borrower for such accommodation up to 7 and 7½ per cent. The inquiry for money in connection with stock speculation has not been as urgent as heretofore, but the continued demand from the inland cities for money to carry on the enormous volume of business in all branches of trade, and for crop moving, has drawn heavily upon the resources of the banks. In addition to the drain from this source, provision must also be made during the week for the Oct. 1 interest and dividend disbursements, which are estimated at about $60,000,000, and for the withdrawal by the trust companies of $10,000,000 for reserve requirements. The heavy demands upon the resources of the banks has produced a situation that makes further relief by the Treasury Department desirable. Up to the present time no intimation as to Secretary Shaw's intention has been received, but in banking circles the belief is quite general that at the proper time the Secretary of the Treasury will use a considerable part of the $75,000,000 Government funds now at his disposal to relieve the urgent demand for money. This may be accomplished by depositing substantial sums with the national banks in cities outside of New York, or by purchasing the 4-per-cent Government bonds maturing next year at a price that will be attractive to bondholders, and at the same time save to the Government part of the interest between now and maturity of the issue. The advances by the Federal Treasury on gold engaged for import from Sept. 10 to Sept. 26, inclusive, amount to $35,505,000, and while further engagements of the yellow metal are announced from time to time, the movement in this direction is believed to be near an end. The attitude of the Bank of England toward further withdrawals of gold for shipment to this side was clearly shown during the week, by an advance of ½ to 1 per cent above the minimum discount rate to other than the bank's regular customers. This action was doubtless taken to check the inroads being made upon that institution's supply of gold, and which have proved effective. Cotton and grain bills are appearing in the foreign exchange market in increasing volume, and unless the supply of these bills assumed proportions large enough to depress exchange rates to a point which will enable local bankers to overcome the obstacles placed in the way of obtaining further supplies of gold by the Bank of England, our bankers will be compelled to depend entirely upon the open market supplies at London and Paris.

The bank statement published on Saturday last was extremely favorable, the increase in cash amounting to $12,220,500. The reserve required was $4,440,975 more than in the previous week, which, deducted from the gain in cash, resulted in an increase in the surplus reserve of $7,779,535. The surplus now stands at $11,315,925 and compares favorably with those in the corresponding periods of recent years. In 1905 the surplus was $5,235,050; in 1904, $26,251,025; in 1903, $11,569,300; in 1902, $3,235,625; in 1901, $16,552,325, and in 1900, $16,552,328.

The Stock Market

The stock market during the past week was dominated by the monetary situation, and this was reflected in a selling movement which resulted in a moderately lower level of prices. Price fluctuations were wide, but the average change was confined to less than 3 points, and it was obvious that the speculative situation is well under control. The bulls had counted upon large gold imports to stimulate an upward movement in stocks, but while the engagements since the Treasury order went into effect on the 10th, aggregate about $35,500,000, the demand for money has been such that commercial borrowers have been compelled to pay what may be considered exorbitant rates. The belief is general that Secretary Shaw will relieve the situation by depositing substantial amounts of money in the national banks outside New York, in order to supply funds for the movement of grain and cotton, and it is expected that such Treasury action will be taken before the close of the current week. Unless something of the kind is done there is every probability of another flurry in call money rates at the end of the month, and speculative interests may take advantage of the situation to bring about such an advance in order to depress prices for stocks. So far as fundamental conditions are concerned, there is no basis for pessimism. From all sections of the country the reports are of the most encouraging character, and there could not be better evidence of the legitimate demand for money than these very reports. Grain is moving freely, the iron and steel trades are rushed with orders for early and late delivery; new cotton is moving in liberal volume, and all commercial conditions indicate a larger demand for financial accommodation. August exports demonstrated that our foreign trade is heavy, and the ruling low price for cotton should stimulate an outward movement of that staple, with a consequent increase in our foreign credit balances.

The speculation just now is governed by rumor more than by actual developments. The "ore deal" is much discussed, but no new facts in connection with it have come to light, and official announcement is likely to be delayed; increased dividends are a potent influence, and there is expectation that such action will be taken by the directors of the Pennsylvania, Norfolk & Western, Chesapeake & Ohio, United States Steel, the Copper stocks, Atchison, and possibly a few other stocks. The reactionary influence is the political situation. While this is largely local, it nevertheless has an important bearing on the general situation. Recent sales of New York City securities have brought low prices and this is a matter of importance to leading bankers. New stock issues announced during the week include $29,839,560 by the New York Central, being part of the $100,000,000 authorized by the stockholders in April last, and which will be issued at par; $10,000,000 by the Cleveland, Cincinnati, Chicago & St. Louis; $20,000,000 by the Tennessee Coal & Iron Company. In addition to the above, rumor has it that the Southern Pacific will issue a large amount of preferred stock.

The local traction shares were under pressure, based upon possible political developments at Buffalo and Saratoga. It was claimed that the selection of the Democratic convention would be a bear argument on all public utility properties, as the candidate is on record as being in favor of municipal ownership. The reports of the local traction companies show that during the past year they have done very well, and that the development work on the Brooklyn Rapid Transit system will add materially to the net earnings of that company. The State Railroad Commission has authorized the Manhattan Railway Company to issue $4,800,000 new stock for construction and equipment. The New York & Queens County Railway Company has been granted permission to issue a mortgage for $10,000,000, but only $8,000,000 can be issued at this time. Of this amount, $2,000,000 will be used for refunding existing mortgages, and the remainder will be used for new power houses, equipment, etc.

Philadelphia

Trading in the local traction issues was fairly active during the past week, and although prices displayed more or less irregularity, the general tone of the market was strong. Philadelphia Rapid Transit, although considerably less animated than last week, was the active feature of the trading, about 17,000 shares changing hands at from 30 to 29¼ and back to 29¾. Union Traction displayed considerable strength early in the week, the price rising to 65¼, but subsequently there was a reaction to 64¾. Upwards of 700 shares were dealt in. Philadelphia Company common was more active, 1800 shares changing hands at prices ranging from 49½ to 50½, the final transaction taking place at 50. Odd lots of the preferred sold at 48½. American Railways showed strength, 500 shares selling at from 51¾ to 52¼. Consolidated Traction of New Jersey sold at 78 for odd lots. Other transactions included Lehigh Valley Transportation common at 10¼, the preferred at 20; Philadelphia Traction at 98¾ to 98½, and United Traction of Pittsburg preferred at 50 to 50¼.

Baltimore

The market for tractions at Baltimore was extremely quiet and irregular. United Railway issues furnished the bulk of the business. The 4 per cent bonds opened at 89¼ and on purchases of about $25,000 advanced to 89½. The certificates representing income bonds deposited opened at 70⅜ and ran off to 69⅝ on sales of $26,000. The funding 5s were firm, $16,000 changing hands at 89⅝ to 89. Sales of United Railway free stock were made at 15. Lexington Street Railway 5s were decidedly strong, $6,000 selling at 101½ to 102½. Washington City & Suburban 5s sold at 103½, and Norfolk Railway & Light 5s brought 99½. Announcement was made by the Maryland Trust Company that the income bonds of the United Railways & Electric Company deposited under the funding agreement amounted to $12,510,000. It was also stated that holders of substantial amounts of the bonds have asked for an extension of time and have promised to deposit their holdings under the agreement before Nov. 15.

Other Traction Securities

The feature of the Boston market was the unusual activity in Boston Elevated, which was accompanied by a sharp advance in the price of the stock. Opening at 154, the price dropped 2 points, but subsequently there was an advance to 156, the highest price attained by this stock for a long while. Upwards of 1300 shares were dealt in. Massachusetts Electric issues were extremely quiet and somewhat lower, about 400 shares of the common changing hands from 20¼ to 19¾, while the preferred declined from 72½ to 72. Boston & Worcester preferred sold at 81½, and Boston & Suburban common brought 15. West End common sold at 97 and the preferred at 108½ to 108¾. The Chicago market was practically at a standstill. Metropolitan Elevated common sold at 27 and the preferred at 67½. It is now said that the management of the Metropolitan Elevated Railroad Company will carry out the general financial plan before beginning dividend payments on the preferred stock. The bondholders committee of the North Chicago Street Railway Company formed for the purpose of protecting the interests of the refunding 4½ per cent gold bonds met this week and organized by electing N. W. Harris, chairman, and H. A. Dow, secretary. In addition to the above named, the committee is composed of G. P. Hover, Allen B. Forbes, D. M. Cummings and E. K. Boisot.

Cincinnati, Newport & Covington common stock has been very active in Cincinnati. There are new rumors that the Schoepf syndicate is negotiating for the property. The company has been earning a large surplus, and some of the directors are anxious to have the common stock placed on a dividend paying basis, but this dividend is opposed by President James C. Ernst, who wants the money spent in improvements. The common stock advanced to 75⅛ and the preferred to 98. Toledo Railways & Light sold at 32¼, Cincinnati Street Railway at 141, the latter a decline of two points.

Northern Ohio Traction & Light came in for considerable activity last week, selling at 28½. Cleveland Electric opened the week at 71, but declined to 68¾. Lake Shore Electric sold at 15½ and later at 16¼. A few small lots of Cleveland & Southwestern preferred sold at 61¼. Western Ohio sold at 13. Both of these stocks have been inactive for some time. Baltimore Terminal Underwriting has been in demand in Cleveland, and it went to 5 points, advancing the early part of this week to 5¾. Washington, Baltimore & Annapolis bid at 13½ with no sales.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Sept. 19	Sept. 26
American Railways	51¾	52¼
Boston Elevated	153¾	156
Brooklyn Rapid Transit	80⅛	76
Chicago City	160	150
Chicago Union Traction (common)	4¾	4¼
Chicago Union Traction (preferred)	18	17¾
Cleveland Electric	70	*69
Consolidated Traction of New Jersey	77	78
Detroit United	94	94
Interborough-Metropolitan, W. I.	38⅝	36
Interborough-Metropolitan (preferred), W. I.	77½	76¼
International Traction (common)	54½	62
International Traction (preferred), 4s	76	81
Manhattan Railway	144¼	140¼
Massachusetts Electric Cos. (common)	20	19
Massachusetts Electric Cos. (preferred)	72½	71¼
Metropolitan Elevated, Chicago (common)	26	26
Metropolitan Elevated, Chicago (preferred)	66½	66½
Metropolitan Street	107	105¼
North American	92⅞	91½
North Jersey Street Railway	27	27
Philadelphia Company (common)	—	—
Philadelphia Rapid Transit	29¾	29¾
Philadelphia Traction	98½	98
Public Service Corporation certificates	69½	69
Public Service Corporation 5 per cent notes	—	94
South Side Elevated (Chicago)	95	96
Third Avenue	126	124
Twin City, Minneapolis (common)	114½	114¾
Union Traction (Philadelphia)	64	64½
West End (common)	—	—
West End (preferred)	—	—

* Asked.

Metals

According to the "Iron Age" the pig iron markets throughout the country have been quiet. From the West come reports of increasing scarcity of steel. There are in the Chicago market now two inquiries for 10,000 tons each of forging and axle billets. The railroads continue to appear as important buyers for next year, and there are in the market inquiries for steel rails aggregating between 150,000 and 200,000 tons. In the lighter lines there is enormous pressure to meet the demands.

Copper metal continues strong, prices for all the principal grades advancing to the highest points in years. Lake is quoted at 19¾ and 20c., electrolytic at 19⅝ and 19⅞c., and castings at 19½ and 19¾c.

A NEW ELECTRIC CAR LINE INTO NEW ORLEANS

The St. Bernard Traction Company, of New Orleans, was organized Sept. 20, with a capital stock of $300,000, for the purpose of constructing and operating an electric railway from the Stock Landing to the district Court House. The officers and board of directors for the company will be elected at a meeting of the stockholders to be held within a few days. New Orleans and Eastern capitalists are behind the project and it is understood that the New Orleans Railway & Light Company is also interested. The construction of this line will probably mean the operation of cars as far as Borgnemouth within the next six months. The extension to the district Court House will be made later. The line, when completed, will traverse 12 miles of suburb, and will be, it is believed, a continuation of the Dauphine line of the New Orleans Railway & Light Company.

UNITED POWER AND TRANSPORTATION MAKES PURCHASE

The Philadelphia, Bristol & Trenton Street Railway has passed into the hands of the United Power & Transportation Company, which owns a connecting line, the Holmesburg, Tacony & Frankford Street Railway, and operates the Trenton Street Railway system. No figures as to the amount of money involved in the transaction has been given out. It is understood that the line will be operated by the Holmesburg, Tacony & Frankford system, which has been running cars over the Philadelphia, Bristol & Trenton line (under a joint traffic agreement) from the Philadelphia city line, near Torresdale, to Bristol. There is a break of about 200 ft. in the line at Bristol, passengers walking across the Pennsylvania Railroad tracks. From Bristol the line extends to Smith and Bridge Streets, in Morrisville, from which point cars are run over the Yardley, Morrisville & Trenton (New Jersey & Pennsylvania Traction system) Street Railway to Warren and Hanover Streets, Trenton. The agreement with this latter company has, it is said, three years yet to run. Whether the Philadelphia, Bristol & Trenton Railway will make an attempt to get into Trenton over the lower Delaware River bridge is not known, but if it should succeed in so doing, cars could be run to the center of Trenton over the tracks of the Trenton Street Railway, which run direct from the City Hall to the lower river bridge. A franchise would be necessary in Morrisville either for a track on some street other than Bridge Street, or for the joint use of the Yardley, Morrisville & Trenton track on that thoroughfare.

ANNUAL REPORT OF THE AMERICAN RAILWAYS COMPANY

The report of the American Railways Company for the year ended June 30, 1906, as made public at the recent annual meeting of the company, shows earnings as follows:

INCOME

Interest and dividends on bonds and stocks owned by the company	$331,830.66	
*Miscellaneous income	154,881.23	
Gross income		$486,711.89

DEDUCTIONS FROM INCOME

General expenses	$297.32	
Printing and registration of stocks and bonds	4,206.69	
Legal expense	1,602.24	
Taxes	13,000.00	
Interest on funded debt	121,775.00	
Depreciation of office furniture and of engineering department instruments	600.79	
Total deductions from income		$141,482.04
Net income		$345,229.85
Dividends paid		251,385.00
Surplus		$93,844.85
Surplus June 30, 1905		357,820.39
		$451,665.24
Charged off on account of depreciation of Chicago Union Traction Company's capital stock	$71,250.00	
Adjustment of disputed taxes of the People's Railway Company, of Dayton, for years 1899 to 1905, inclusive	30,944.50	
	$102,194.50	
Profits from sale of securities and property	57,617.56	
Net charges to "profit and loss"		44,576.94
Surplus June 30, 1906		$407,088.30

GENERAL BALANCE SHEET FOR FISCAL YEAR ENDING JUNE 30, 1906

Assets

	Total Issue	Owned by the A. R. Co.	Value on A. R. Co. Books
The Springfield Railway Company first mortgage bonds, 6 per cent	$500,000	$500,000	$500,000.00
The Springfield Railway Company capital stock	1,000,000	994,400	39,959.16
Bridgeton Electric Company capital stock	25,000	25,000	17,270.44
Bridgeton & Millville Traction Company capital stock	200,000	200,000	159,364.32
The People's Railway Company capital stock	1,100,000	1,100,000	1,334,228.59
The Springfield Light & Power Company capital stock	700	700	700.00
Altoona & Logan Valley Electric Railway Company capital stock	1,500,000	1,500,000	403,750.00
Du Page Construction Company capital stock	25,000	25,000	25,000.00
Dellwood Park Company capital stock	78,750	78,750	78,750.00
The Franklin Real Estate Company capital stock	10,000	10,000	10,000.00
Chicago Union Traction Company capital stock ... Preferred; Chicago Union Traction Company capital stock ... Common		....	75,000.00
Scranton Railway Company capital stock, preferred	1,500,000	1,495,800	1,495,790.50
Scranton Railway Company capital stock, common	2,000,000	1,991,850	1,995,375.13
Total cost of stocks and bonds			$6,135,188.05
*Bills receivable, accounts receivable, etc			$3,876,206.88
Office furniture and fixtures			4,023.20
Engineering department instruments			1,158.91
Fire insurance fund investments			126,480.00
Interest on bonds owned, accrued, but not due			15,387.29
Call loans			300,000.00
Cash on hand			103,692.10
			$10,562,136.53

* Chiefly advances to subsidiary companies.

Liabilities

Capital stock	$5,051,300.00
Collateral trust convertible gold 5 per cent bonds	2,435,500.00
New York Trust Company, trustee Scranton Railway Company preferred stock	1,495,000.00
Bills payable	975,000.00
Vouchers payable	36,402.30
Bills audited, but not paid	1,379.66
Accident insurance fund	5,467.69
Fire insurance fund	130,365.19
Taxes accrued, but not due	14,485.48
Interest accrued, but not due, on funded debt	10,147.91
Profit and loss, surplus, as per operating report	407,088.30
	$10,562,136.53

E. & O. E. WALTER W. PERKINS, Treasurer.

Besides these earnings the report also contains a list of the stocks owned by the American Railways Company, June 30, 1906, also the bonds and the stocks and bonds of the subsidiary companies.

In presenting the report, President Sullivan said in part:

To the Stockholders of the American Railways Company:

The president, on behalf of the board of directors, presents the following report for the year ending June 30, 1906:

Gross earnings of subsidiary companies, $2,099,816.57. This represents an increase over 1905 of $627,878.62, of which $463,849.45 are the gross earnings of the Scranton Railway Company for six months, showing an increase on the properties owned in 1905 of $164,029.17, or 11.14 per cent.

After paying all fixed charges, interest and taxes the net income is $345,229.85.

There was paid in dividends to the stockholders of the American Railways Company $251,385, showing an increase of $16,642.50 over the amount paid the previous year. This leaves a balance of $93,844.85 to be credited to surplus account, which, after certain adjustments hereinafter noted, contains a balance to the credit of surplus on June 30, 1906, of $407,088.30.

As shown in our report in 1905, certain bonds in the treasury of the company were sold at a profit, which profit had been carried to the credit of the bonds still held. These bonds, viz.: $1,100,000, par value, Altoona & Logan Valley Electric Railway Company 4½ per cent bonds were sold during the year, and the profit carried to surplus account.

The sale of the property of the Springfield Light & Power Company, referred to in my last annual report, has been finally closed by the payment of the notes received in settlement. The profit realized on the sale has been carried to the credit of surplus account, the total amount of profit on this sale and on that of the 4½ per cent Altoona bonds being $57,617.52.

There has been charged off during the year the sum of $71,250, and deducted from surplus account to make the book value correspond with the market value of Chicago Union Traction stock as of June 30.

On June 30, we reached an agreement with the taxing authorities of the city of Dayton, as to certain taxes which have been in dispute for the years 1899 to 1905 inclusive, and settlement was made for the same on that date in the sum of $30,944.50, and the same was charged to surplus account.

During the year we carried 48,879,689 passengers, showing an increase of 15,657,676; of this increase 11,118,827 is due to the purchase of the Scranton Railway Company, leaving a net increase on the properties previously owned of 4,538,849, or over 13 per cent.

During December, 1905, we agreed to purchase the stock of the Scranton Railway Company for $3,500,000, being the par value of the preferred and common stock.

On Jan. 5, 1906, we took over the property and assumed the management of the same. The $1,500,000 of preferred stock was paid for in 5 per cent trust certificates. As regards the $2,000,000 of common stock, we paid $1,000,000 in cash and gave notes for $975,000, due Dec. 15, 1906. The remaining $25,000 worth of stock has been nearly all acquired since and paid for in cash.

As regards the capital stock of the Springfield Light & Power Company, for legal reasons it is not possible at the present time to liquidate this company completely, formal action was taken reducing its capital stock to seven shares (those necessary to qualify its directors), and the balance of its cash assets were turned into the treasury of the American Railways Company, the only stockholder. It now appears on our balance sheet at the sum of $700.

On Jan. 31, 1906, the capital stock of the American Railways Company was increased $1,135,800, making the capital stock stand at $5,090,100. The increase was made to provide in part for the

purchase of the Scranton Railway, and for other corporate purposes. Stockholders were given the privilege to subscribe at par for 30 per cent of their respective holdings, under which right 21,940 shares of additional stock has been issued full paid; 1552 shares have been issued $25 per share paid, the remaining $25 per share will become due and payable on Sept. 15 next.

During the year the fire insurance fund of the company has been continued with success. From premiums charged and interest on invested funds $20,824 has been added to the sum invested for fire protection.

In November last we purchased 63 acres of land known as "Dellwood," 3 miles from Joliet, and 1 mile south of the city of Lockport. This property is well wooded and has an attractive and deep glen running through it. The tracks of our Chicago division pass directly in front of the entrance to this park.

For the purpose of developing the park, the Dellwood Park Company was formed during the year, your company subscribing for all of its capital stock, and has up to June 30 paid in thereon the sum of $78,750, which appears in the balance sheet. Permanent and attractive improvements have been made which, we trust, will be highly advantageous to this company.

The statement of general expense in the treasurer's report shows a marked decrease. This is caused by the policy adopted this year of charging direct to the underlying companies the expenses of the Philadelphia office other than strictly corporate expenses of the American Railways Company.

We have expended during the year the sum of $518,046.82 in construction and equipment on the different properties as follows:

Altoona & Logan Valley Electric Railway Company	$215,835.55
Chicago & Joliet System	17,201.98
The Peoples Railway Company	67,301.34
The Springfield Railway Company	28,273.27
Bridgeton & Millville Traction Company	7,717.24
Bridgeton Electric Company	9,711.78
Home Electric Light & Steam Heating Company, Tyrone	3,377.50
The Franklin Real Estate Company	3,255.85
Dellwood Park Company	110,399.21
Scranton Railway Company (six months)	54,973.00
Total	$518,046.82

ARRANGEMENTS FOR THE A. S. & I. R. A. CONVENTION

Under date of Sept. 26, the American Street and Interurban Railway Association issued through its secretary, B. V. Swenson, a most important circular dealing with arrangements for the convention at Columbus during the week beginning Oct. 15, of which the following is an extended digest:

The New England, Trunk Line, Eastern Canadian, and Southeastern Passenger Associations have granted the rate of a fare and one-third on the certificate plan for all points within their territory. The Central Passenger Association has granted similar rates for all territory excepting from points in the State of Ohio. The Western Passenger Association has granted the same rate from all points in its territory including all points in Colorado. The Southwestern Passenger Bureau grants the rate, excepting for points on the Fort Worth & Denver City Railway. The Trans-Continental Association grants the regular nine months rates which are in effect from Pacific Coast points daily, to Chicago, St. Louis, Minneapolis, Missouri River points, Sioux City, Council Bluffs, Omaha, St. Joseph, Kansas City, Memphis, New Orleans, etc., and which approximate 2 cents per mile in each direction, or about one fare and one-third for the round trip. The nine months rates do not apply to intermediate or interior points, but only to what are known as the Eastern gateways of the association, such as those named. Delegates coming from Pacific Coast points may obtain the fare and one-third rates to Columbus from these Eastern gateways of the Trans-Continental Passenger Association.

The usual rules are observed in granting the reduced rate on the certificate plan. Tickets for return journey will be furnished only on certificates procured not sooner than Thursday, Oct. 11 (except that when meetings are held at distant points to which the authorized transit limit is more than three days, the authorized transit limit will govern), nor later than Wednesday, Oct. 17, and will be available for continuous passage only, no stop-over privileges being allowed. Certificates will not be honored for return trip if presented later than Tuesday, Oct. 23. The special agent at time of validation will collect from the holder of each certificate a fee of 25 cents.

It is expected that special trains or special cars will be run to Columbus from various centers, such as Boston, New York, Philadelphia, Chicago and St. Louis. The executive committee of the Manufacturers' Association has selected the New York Central lines as its official route from New York City. The New York Central people have made the following arrangements regarding schedule and equipment: The special train will consist of baggage, buffet, library, smoking car, with barber and bath, Pullman open section, compartment drawing room and observation cars of latest design, together with two dining cars, which will insure comfort and leisure to members and their guests. The schedule of trains leaving Sunday, Oct. 14, will be as follows: Leave Boston, via Boston & Albany Railroad, 10:45 a. m; Worcester, 11:55 a. m.; Springfield, 1:11 p. m.; Pittsfield, 2:59 p. m. Leave New York, New York Central Railroad, 2:04 p. m.; 125th Street, 2:17 p. m.; Albany, 5:08 p. m.; Schenectady, 5:36 p. m.; Utica, 7.09 p. m.; Syracuse, 8.24 p. m.; Rochester, 10:00 p. m. Leave Buffalo, Lake Shore Railway, 10:52 p. m.

Rate named for this meeting is fare and one-third, on certificate plan. When purchasing ticket for the going-trip ask ticket agent for a certificate which, when properly validated, will entitle passenger to one-third fare returning. Pullman accommodations will be at regular rates.

For reservations apply to Milton C. Roach, assistant general passenger agent, New York Central lines, 1216 Broadway, corner Thirtieth Street, New York. Those starting from Boston apply to R. M. Harris, city passenger agent, Boston & Albany Railroad, 366 Washington Street, Boston.

The Pennsylvania Railroad has announced it will run a special train (or cars) from New York to Columbus for the accommodation of the delegates and others attending the convention, leaving New York at 8:25 p. m., Saturday, Oct. 13, 1906, and arriving at Columbus at 1:40 p. m., Sunday, Oct. 14, thus affording practically a day's rest prior to the convening of the convention on Oct. 15. The Pullman berth rate is $3.50; section, $7.00, and drawing room $12.00 each way. Accommodations on this train must be obtained by writing Colin Studds, Eastern passenger agent, Pennsylvania Railroad, 263 Fifth Avenue, New York City.

An erroneous impression seems to be prevalent in some sections of the country in regard to hotel accommodations and hotel rates. The secretary of the association was at Columbus on Sept. 12 and 13, and investigated these matters. The difficulty concerning accommodations has been due largely to the fact that while applicants have been notified that a certain number of rooms at stated hotels have been assigned to them, they have not been given the specific numbers of their rooms in the different hotels. Up to the present time it has not been practicable for the hotel people to give specific numbers of rooms, but notices are now being sent out to all applicants giving the name of the hotel and the room numbers in each case. All who go to Columbus to attend the convention will be well taken care of as far as hotel accommodations are concerned.

Henry C. Pirrung, chairman of the convention committee of the Columbus Board of Trade, guarantees that the regular rates will apply at all hotels in the city throughout the convention period. Because of the large attendance at the convention and the consequent great demand for hotel accommodations, this guarantee is made with the understanding that two persons occupy a single room, and that each person pay the regular rate for that room, whether on the European or American plan. Each room will be provided with two beds, double towel service, etc., so that there will be no doubling up, excepting in so far as two persons occupy one room. In general, hotel accommodations should be reserved for the entire five days of the convention. If it becomes necessary to cancel the accommodations for certain days of the convention week, this matter should be taken up direct with Mr. Pirrung.

The convention and exhibit halls are located at the State Fair Grounds, at the north end of the city. The Columbus Electric Railway & Light Company will run cars direct to the Fair Grounds, passing by the Southern, Neal, Chittenden and other convention hotels. These cars will be provided with signs indicating their destination. The trip from the Southern Hotel to the Fair Grounds entrance is a 14-minute ride. The distance from the gate to the convention and exhibit halls is short, being but a 3 or 4-minute walk. In case of inclement weather conveyances will be provided at this point of the route.

The advance copies of convention papers are now being printed, and will be mailed to member companies as soon as they are ready for distribution.

THE CLEVELAND SITUATION

The Cleveland Electric Railway Company, acting as a taxpayer, has requested the City Solicitor to bring action to nullify the franchises of the Forest City Railway Company, on the grounds that at the time the ordinances were passed, approved and accepted, the Mayor of the city was, and still is, interested in the profit of the grants made by such ordinances, and is financially interested in furthering the street railway enterprise. This announcement caused a decided sensation in Cleveland. The City Solicitor replied by requesting the company to present all evidence it may have upon the subject in question. In an open letter, Mayor Johnson does not deny that he has frequently lent his credit to the Forest City Railway Company, and that he has endorsed the promises of the company made to property owners to pay paving rebates in return for property owners' consents. At the Council meeting Monday night, the Forest City Railway Company was granted franchises on Central Avenue and on Quincy Street, and on the east side of the Public Square from Superior Street to Euclid Avenue.

The Forest City Company is pushing work on the equipment of its power station, formerly a water-works pumping station leased from the city, and it claims that within thirty days it will be operating cars over the route from Denison Avenue across Fulton Street, and down Detroit Avenue to Pearl Street, and thence to the Public Square. About one-quarter of the distance is over the tracks of the Cleveland Electric Railway on alleged free territory. The company has not yet made its connections with the free territory tracks being held up by a switch on Fulton Road, owned by the Cleveland Electric. It is attempting to get around this by building through Franklin Circle, a small park owned by the city. The property owners near the park object to building through the circle, and this question has yet to be settled.

The City Council has fixed the amount which the Forest City Company is to pay the Cleveland Electric for the use of the free territory tracks.

OLD COLONY OVERCOMES OBSTRUCTIONISTS

The Old Colony Street Railway Company has overcome the obstacle that has for some time stood in the way of a fourth trolley freight and express route in Southeastern Massachusetts. The company started its first freight cars between Taunton and Providence in midsummer of this year; later it added an extension between Taunton and the important shoe center of Brockton; several weeks ago it extended the service still further by adding other cars between Brockton and North Abington, Rockland and Whitman; finally it sought to give a fourth extension by running a car from Brockton down through West Bridgewater and Bridgewater to Middleborough. It proved easy to get the local rights in Bridgewater and Middleborough, but in West Bridgewater it was different. There the grant was held up, and for a time it looked as if the Middleborough connection would have to be temporarily abandoned.

A fortnight ago, however, the Old Colony began to figure out a way of getting around the obstructing town. It has a line from Bridgewater to Taunton, by way of Raynham, and after some study it was deemed feasible to start the Middleborough service from Taunton instead of Brockton. The local rights in Raynham were secured, and the grant approved by the Railroad Commission last week. The single box car that will take care of the business for the present was started on regular trips Monday. It leaves Middleborough in the morning, runs northwest to Bridgewater and southwest to the company's freight station to Taunton. There it exchanges freight to and from Brockton and the other connection places on the north and Providence on the south, the matter being handled by the "through" freight cars already running between Brockton, Taunton and Providence with two round trips daily. The Middleborough car waits for the return car from Providence in the afternoon before making its own return to Middleborough, thus giving Middleborough and Bridgewater one round trip daily. The route for this new car is a little longer than it would be if the connection had been secured with Brockton, but it is expected to answer fully as well. West Bridgewater loses the trolley freight advantage, but the company gets a freight route open to Middleborough, which is virtually the last important town on the run from Taunton to New Bedford.

A change that may develop in connection with the Old Colony company's interesting trolley and boat service between Boston and New York direct was announced in Boston a few days ago. It is the transfer of the Enterprise Transportation Company's property—the water end of the Boston-New York service referred to—to the Dupont Powder Company, of Wilmington, Del. The transfer is supposed to have been in the interests of C. W. Morse, the principal factor in the gradual combination of steamboat and steamship lines along the cost between New York and Boston and Maine and Provincial ports. It is not expected that the change will alter the policy of the Enterprise service at present.

CHANGES IN THE McGUIRE-CUMMINGS MANUFACTURING COMPANY

The McGuire-Cummings Manufacturing Company, since the erection of its new works at Paris, Ill., has found it necessary to establish a New York office and to keep at this most convenient point for export a staff of engineers to look after its increased volume of business. The new offices are located at 42 Broadway, and Elmer E. Cook, formerly with the McGuire-Cummings Company, but lately with a large rolling stock manufacturing company in Great Britain, has been appointed manager.

The opening of the new works marks an important development in the history of this company, as it now enters the field fully equipped to manufacture everything in the rolling stock line, including passenger and freight cars, as well as their many specialties. Considering the number of orders which the company has already received for snow sweepers, it judges the street railway world must be expecting a very severe winter.

THE LIMA & TOLEDO LINE OPENED

The Lima & Toledo Traction Company began operating cars over its line between Lima and Ottawa on Saturday, Sept. 15, at 10 o'clock a. m. The contract for the construction of this line was held by the Stratford Railway Construction Company and sublet to another company, which turned the work over to the Stratford Company on Aug. 17, on account of being unable to complete the line in time to operate the cars on Sept. 15, the date on which franchises expired at Columbus Grove and Ottawa. Gaylord Thompson, president of the Stratford Company, and J. M. Walker, chief engineer, took hold vigorously and succeeded in getting the line into such shape that operation as stated could be begun.

On Aug. 17, there was still 2 miles of track to be laid, 17 miles of poles to be erected, 10½ miles of feeder and trolley wire to be stretched, 10½ miles of track to surface and 5500 yards of excavation and embankment to finish at one point where there was a deep cut and high fill ¾ of a mile apart. The work of getting the excavation completed and track finished was handled by Harry Evans, and that of erecting the overhead by William Jeffries. On Aug. 17, the entire force consisted of about 80 laborers and 7 linemen. This force was gradually increased to 240 laborers and 20 linemen. Poles were set at the rate of 1½ miles per day. A boring machine cutting a hole 24 ins. in diameter was used on some parts of the line for digging holes and a derrick attached to same set the poles in the hole. Feed-wire and three high-tension wires were placed on the poles by means of two masts erected on a car, with booms extending from one mast over the cross-arms, the reels of wire being set in jacks at the front of the train, the wire running through a snatch block on the first mast above the cross-arms and then through blocks on the two booms of the second mast, which left them lying on the proper cross-arms. By this means a mile of wires, consisting of a 300,000 cm cable and three No. 2 high tension could be laid on the cross-arms in 7 to 10 minutes, after connections were made and reels installed in jacks. The trolley wire was erected in much the same way and suspended by means of hooks at each pole. About 5 miles could be put up in one day of 10 hours.

At one or two points on the line considerable ingenuity was used to get the trolley wire up. On account of local difficulties at Ottawa, where the poles had not been set, the trolley wire was suspended from ropes stretched across the street between trees. The track for 10 miles is in good surface and line. The balance is still lying on the subgrade on account of lack of stone for ballast, but a speed of 15 miles per hour can be maintained over any part of it.

THE WEST JERSEY & SEA SHORE OPENED

As scheduled, service was begun Tuesday, Oct. 18, over the electrified line of the West Jersey & Sea Shore Railroad between Camden and Atlantic City, which has been referred to from time to time in the STREET RAILWAY JOURNAL. Through trains leave daily, including Sundays, both Camden and Atlantic City, on the full hour, every hour from 7.00 a. m. to 11.00 p. m. The running time is 90 minutes. The fare one way from Philadelphia to Atlantic City is $1, and an excursion ticket, good for fifteen days, is sold for $1.50.

AN OPPORTUNITY IN MEXICO

Manufacturers of electric railway supplies and equipment would do well to get into communication with Schondube & Neugebauer, electric railway department, Toluca, Mexico, as they contemplate the laying of several lines of electric railways in Mexico, and in a near future will be in the market for bids for the material.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

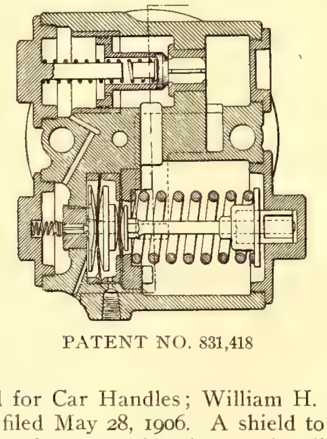
UNITED STATES PATENTS ISSUED SEPT. 18, 1906

831,063. Car Seat; Henry W. K. Hale, Philadelphia, Pa. App. filed April 2, 1902. Relates to twin seats mounted on a common pedestal, and refers particularly to means for positioning and locking the seats at any angle with respect to the car.

831,121. Car Wheel; Edward L. Troup, Wauseon, Ohio. App. filed Dec. 11, 1905. The wheel is provided with a detachable flanged rim or tire, adapted to be securely locked thereon without the use of bolts, whereby the tire may be readily removed from or attached to the body of the wheel without removing the wheel from the axle.

831,149. Amusement Device; Ernest A. Fuller, New York, N. Y. App. filed Dec. 12, 1905. The car passes down an inclined trackway having a U-shaped loop at its lower end, which imparts a rotary movement to the car. A body of water is provided at the bottom of the track into which the car is projected while rotating.

831,216. Car Step; George W. Davis and Joseph A. Hicks, Denton, Tex. App. filed May 21, 1906. An auxiliary step hinged to the lower step of the ordinary set of steps and adapted to fold thereunder when not in use.



PATENT NO. 831,418

831,295. Shield for Car Handles; William H. Pontius, Columbus, Ohio. App. filed May 28, 1906. A shield to prevent persons leaving an open car from grasping the rear handle.

831,325. Rail Sanding Device; Frederick J. Burlingame and Joseph Merrill, Woonsocket, R. I. App. filed Jan. 18, 1906. Relates to details of construction of the discharge valve and agitator.

831,376. Railroad Signaling; Petrus J. Portman, Amsterdam, Netherlands. App. filed July 6, 1905. A special trolley is provided in a steam railroad, and the switches of the track are arranged to establish an alarm circuit therewith when improperly positioned.

831,412. Trolley Wheel; John Brown, Camden, N. J. App. filed Dec. 16, 1905. A pair of auxiliary wheels mounted one on each side of the main wheel, so as to receive the conductor in case the trolley leaves the wire.

831,418. Automatic Air Brake System; Fred. B. Corey, Schenectady, N. Y. App. filed Dec. 19, 1903. This system relates to means for gradually applying and gradually releasing the brakes.

831,467. Trolley Head; William H. Pfrimmer, New Albany, Ind. App. filed Nov. 2, 1905. A pair of arms mounted on the harp which may be projected upward opposite the trolley wheel when guiding the latter onto the wire. When the arms are returned a pair of small guiding wheels are positioned to hold the trolley wheel against leaving the wire.

831,509. Trolley; Jacob T. Haudenshield, Scott Township, Pa. App. filed Nov. 10, 1905. Supplemental arms pivoted at the upper end of the trolley harp and in which the wheel is journaled. The arms are normally held in a vertical position by spring means, but when the wheel strikes an obstruction they are capable of a rearward yielding movement.

PERSONAL MENTION

MR. H. H. CARR, of Newport News, Va., has been appointed general manager of the Raleigh Street Railway Company, as a result of the acquisition of a controlling interest in the company by the Bond & Electric Company.

MR. GEORGE A. SAYLOR has resigned as superintendent of the Indianapolis, Columbus & Southern Traction Company, of Columbus, Ind. Mr. Saylor has been connected with the road from its inception. He will enter commercial work.

MR. FRANCIS H. ELY has been appointed electrical engineer of the Union Railway Company, of New York, to succeed Mr. R. E. Bennings, resigned, who is now in charge of important work at Lima, Peru, for W. R. Grace & Company, of New York.

MR. T. EDWARD HAMBLETON, retired banker and former head of the banking house of Hambleton & Company, of Baltimore, died Friday, Sept. 21, at his country home, aged 78. Mr. Hambleton was the father of the rapid transit system of Baltimore, having financed the cable system, afterwards changed to electric, in connection with the Widener-Elkins syndicate of Philadelphia.

MR. JAMES H. McGRAW, president of the McGraw Publishing Company, publishers of the STREET RAILWAY JOURNAL, the "Electrical World" and the "Engineering Record," has been appointed one of a committee of three by Governor Stokes, of New Jersey, to report on the feasibility of a law providing for a division with the State of the profits of public service corporations derived from privileges they enjoy through the State and the municipalities in which they operate.

MR. O. D. COLVIN, who some weeks ago resigned as general manager and treasurer of the Seattle-Tacoma Power Company, has announced that he will hereafter associate himself with William Piggott, president of the Seattle Car Manufacturing Company, which has its plant at Youngstown. Mr. Colvin will be general manager of the Seattle Car Manufacturing Company. The company intends to secure a new location, its capital stock being increased, and will engage in the manufacture of all kinds of steam railway rolling stock on a large scale.

MR. GEORGE W. PIERCE, who, as noted in the last issue of the STREET RAILWAY JOURNAL, resigned as manager of the Stamford and Port Chester divisions of the Consolidated Street Railway Company, on account of ill health, is succeeded by Mr. E. R. Gilbert. Mr. Pierce has been prevailed upon to retain the position of superintendent of the Stamford lines of the company. Mr. Gilbert will make his headquarters in Port Chester. Mr. Gilbert has had experience in street railway work in Hartford and elsewhere and has worked in the West in railroad and other construction work.

MR. DANIEL T. HUNT, Illinois manager of the American Surety Company, of New York, and former president of the North Chicago and West Chicago Railroad Companies, died suddenly of heart failure, Monday, Sept. 18, in his apartments at the Hotel Del Prado, Chicago. Mr. Hunt was born in Rutland, N. Y., and moved to Rochester when a young man. He lived in that city for thirty years, and was postmaster of Rochester from 1875 to 1887. He was business manager of the Rochester "Post-Express" from 1882 to 1893. He came to Chicago to live in July, 1893, and was made manager of the surety company for Illinois. He succeeded Mr. Charles T. Yerkes as president of the North Chicago and West Chicago Street Railroad Companies in 1899, and took charge of the legal exigencies of the situation after the lines were absorbed by the Union Traction Company. Mr. Hunt is survived by a widow, two daughters and a son.